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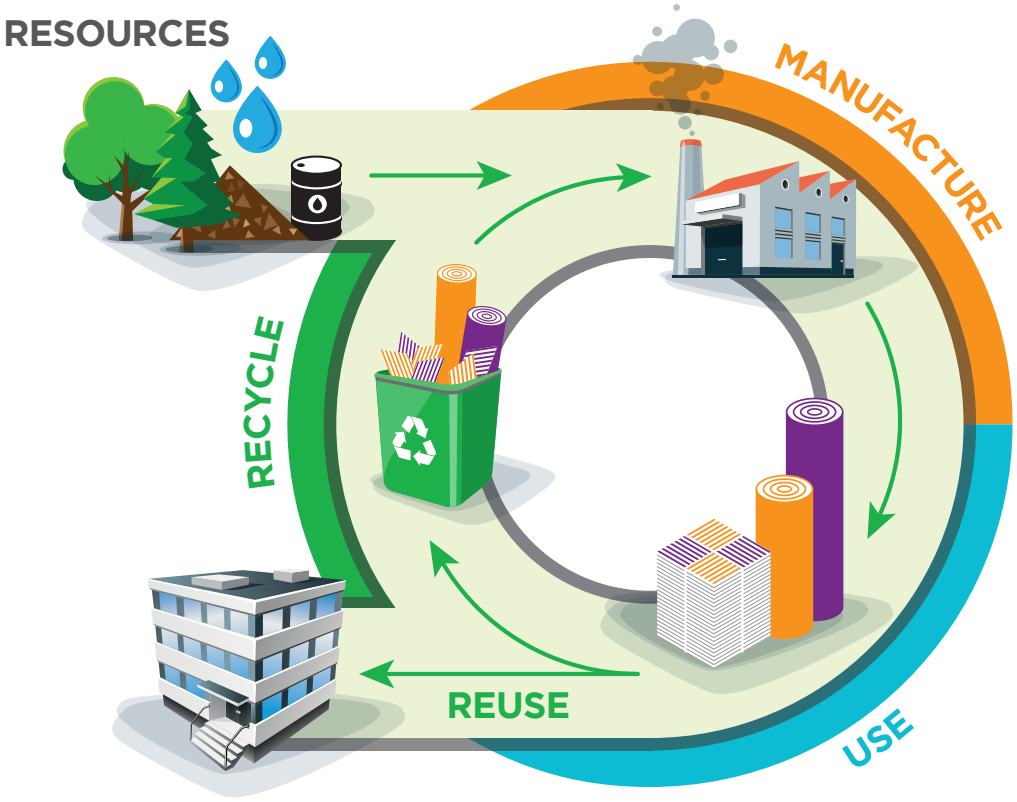

Zero Avoidable Waste in Flooring — Towards a Circular Economy

A SCOPING STUDY INTO THE OPPORTUNITIES

Report compiled by Axion on behalf of the Contract Flooring Association

FEBRUARY 2021

AXION

Circular economy specialists

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Circular Economy Route Map

FOREWORD

Welcome to the CFA's report exploring the concept of zero avoidable waste in the flooring industry, towards a circular economy. This report was commissioned by the Contract Flooring Association (CFA) to build on work that we carried out in 2009 dealing with how our sector could manage resources more responsibly. As work driven by the CFA, it mainly reflects the floor covering categories that our members, as a defined and focussed sector, manufacture, distribute, or install — namely textile flooring (carpet and carpet tiles), timber (solid, engineered and laminate wood) and resilient floor coverings (sheet vinyl, luxury vinyl tiles, linoleum and rubber). These are the "soft" floor coverings used in so many offices, shops, hospitals, schools, many other public buildings and homes.

Why is this report important? Ignoring the main and obvious drivers for looking after our planet for a moment, simply put, commercially, I am confident that more and more specifiers and clients are going to demand environmentally friendly products. Government is moving towards further legislation in areas such as packaging and waste that will increasingly impact our sector and a recent swell of media and public opinion that we need to act quickly to save our planet is measurable. Interestingly, the CFJ/CFA Awards this year called for entries to explicitly explain their sustainability credentials. Would this have been a requirement ten years ago? I doubt it.

The "Circular Economy" is the concept of keeping materials within the economy at the highest level of value for the longest possible time. This goes beyond recycling and brings to the forefront a fundamental re-think in business models to ensure that products and services provide maximum benefit with the minimal impact on resources. I think it is important we understand this more widely as it will become one of the major currencies for doing business as this new decade unfolds. It complements the CFA's more commercially driven annual *Sustainability Guide* by providing an independent perspective on the challenges and opportunities for improving the environmental credentials of the flooring industry.

There is much to think about and many positive messages we can take from this report. However, I cannot emphasise enough that I see a change where we no longer have to seek areas of engagement with the sustainability agenda. It is being firmly driven by clients, the government and wider public opinion. Fortunately, the flooring sector is also taking its responsibility seriously. We are a proactive part of construction that can be relied upon to innovate and self-regulate and there is a strong voice — through the CFA — that leads and delivers those messages.

For further information about the CFA and our members, please visit **www.cfa.org.uk**

Richard Catt | Chief Executive Officer

Executive Summary

In 2009, The Contract Flooring Association (CFA) initiated a study to develop a Resource Efficiency Action Plan for the flooring industry that was funded through a joint partnership between WRAP and BRE and was published in 2010. This plan identified the actions the flooring industry needed to take to reduce the level of waste and improve resource efficiency.[1]

Recently, the CFA has sought to update the original 2010 Resource Efficiency Action Plan for flooring and as such, commissioned Axion to carry out a scoping study to establish what actions can now be taken as a sector towards achieving Zero Avoidable Waste (ZAW) in flooring. Over the last 10 years there has been a considerable increase in activity from the flooring sector with regards to waste, and it is now appropriate to update the plan as take-back schemes such as Carpet Recycling UK (CRUK) and Recofloor were newly set up in 2008/2009 and yet to have a significant effect on the industry.

Significant progress has been made since 2010 by flooring manufacturers and the wider flooring industry in their efforts to reduce waste and improve resource efficiency. This scoping study has identified several high level opportunities which can be acted upon to build on the current work towards zero avoidable waste. These primary opportunities include:

- **Increasing the awareness of and participation in existing recycling and re-use schemes as well as establishing new ones to increase capacity**
- **Encouraging green procurement within public sector building contracts to favour flooring solutions that can provide a re-use or recycling route at end of life**
- **Publishing best practice guidance for flooring design to encourage design for recycling**
- **Utilising existing tools such as building information modelling to facilitate the recycling and re-use of materials both during and at the end of a buildings lifetime**

The proposed ZAW plan is independent of the type of flooring and it is not recommended that at this stage an individual plan is made for the different types. This is because the fundamental barriers are the same regardless of the material and format. The solutions to address those barriers will be unique, but the entire flooring sector should have a common, clear goal.

These barriers can be converted into four key opportunities towards achieving Zero Avoidable Waste:

- **Design: The design of the flooring product is key in reducing material consumption, and/or allowing for its re-use and recycling at end of life**
- **Infrastructure: The collection and processing infrastructure must be further developed in order to enable practical, cost effective and efficient re-use and recycling routes**
- **Information: Improving access to information regarding availability of collection systems and which materials and products have been used in a building's construction would go some way towards diverting material from waste and into re-use or recycling routes**

1 CFA, BRE 2010. Flooring: A Waste Reduction Action Plan — Towards Improved Resource Efficiency

- **Business Models: Fundamentally rethinking current business models such as product leasing or a deposit return system to allow manufacturers to retain ownership of their products and facilitate the circular use of material in the manufacture of new products**

These opportunities cannot be achieved by the flooring sector acting alone. Further work is required to engage with stakeholders to draw out the fine detail but it is clear that it will require fundamental changes in the way the sector utilises resources and its perception of waste, and a highly collaborative approach to achieve the ambition of Zero Avoidable Waste in flooring.

Introduction

In the UK, Construction, Demolition and Excavation (CD&E) accounts for 61% of the waste generated each year. In 2016 this equated to 136.2 million tonnes. Of this, 66.2 million tonnes was considered non-hazardous Construction and Demolition waste (C&D). The UK has a target to recover at least 70% of non-hazardous C&D waste by 2020.

This target is currently being surpassed and DEFRA estimate it to be at 92% recovery.[2] This has remained static since 2010. This high recovery rate is very positive, however there is very little detail on the individual materials from this sector. It is likely to be dominated by the recovery of heavy materials such as stone which can be used as an aggregate. Within the C&D waste, much of the lower tonnage material is not recovered.

This report follows on from the original Flooring Waste Reduction Action Plan published in 2010 and builds on that report's findings to develop a Zero Avoidable Waste plan for the flooring industry. Although this scoping study focuses only on flooring, it is acknowledged that in order to transition fully to a circular economy, collaboration will be needed across all materials and products within the construction sector. This report also currently focuses on flooring only and not the associated packaging.

The scoping study is focused on three types of flooring, primarily in the contract flooring sector:

- **Textile: Carpet tiles and broadloom carpet**
- **Resilient: Vinyl sheet, luxury vinyl tiles (LVT), Stone Plastic Composite (SPC) and Wood Plastic Composite (WPC), rubber and linoleum**
- **Wood: Solid wood, engineered wood and laminate**

The contract market has been focused on in this study as there is the potential for significantly more control over this than the domestic sector.

This scoping study is to be used to create a Zero Avoidable Waste (ZAW) plan for the flooring industry. ZAW builds on the concept of the circular economy but brings with it the understanding of some of the constraints faced by legacy materials.

To begin to understand ZAW, first the waste hierarchy must be defined. The Waste Hierarchy is a well-established concept and is still relevant today. The hierarchy is shown in Figure 1 (overleaf).

2 DEFRA 2019, UK Statistics on Waste

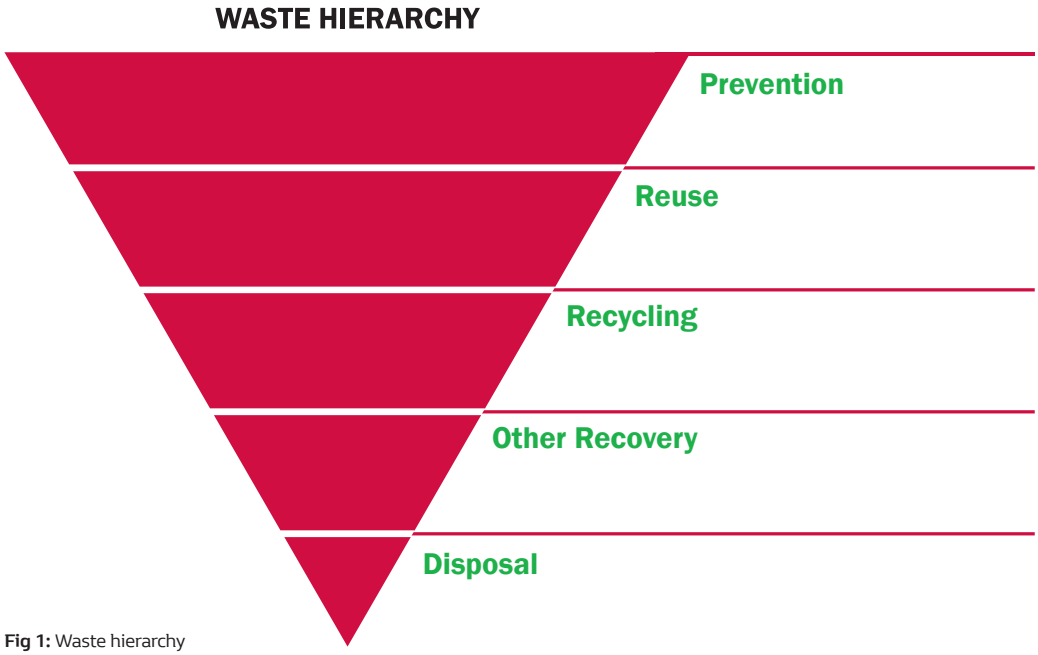


Fig 1: Waste hierarchy

The downside of the hierarchy is that it focuses on "waste". This assumes already that a product has a "linear" life cycle and inevitably will become waste. The evolution of the hierarchy has come with the concept of the Circular Economy; the concept of keeping materials within the economy at the highest level of value for the longest possible time. This goes beyond recycling and brings to the forefront a fundamental re-think in business models to ensure that products and services provide maximum benefit with the minimal impact on resources.

The Circular Economy can be applied to any service or product. This is the foundation for the strategy of Zero Avoidable Waste which has been interpreted in the Green Construction Board (2020) Report as:

> *"Zero Avoidable Waste in construction means preventing waste being generated at every stage of a project's lifecycle, from the manufacture of materials and products, the design, specification, procurement and assembly of buildings and infrastructure through to deconstruction. At the end of life, products, components and materials should be recovered at the highest possible level of the waste hierarchy, i.e., re-used before being recycled, whilst ensuring minimal environmental impact."*

Brief Status of the Industry

The flooring industry have undertaken steps over the years to reduce the environmental impact of their products. Flooring is a vital product, one in which function cannot be compromised.

In many ways, the flooring industry is significantly more advanced than other construction products in that design for recycling, waste minimisation during production and the establishment of take back and recycling schemes are already prominent. This report details the barriers faced by the industry to focus efforts for future work.

There are several areas the industry have already addressed, most notably in the design stage of the flooring. There have also been advancements in the collection of flooring for re-use and recycling, which are discussed further in

the individual product portfolios. Notable amongst these is the infrastructure to enable the reuse or recycling of modular carpet tiles, as well as collection and recycling schemes for vinyl flooring.

These have been driven by the manufacturers' desire to reduce environmental impact, and third parties able to make a business model out of recycling and reuse. There is a limit however to how effective these advancements in the industry can be without significant changes in business models and funding mechanisms to allow for even more re-use and recycling at end of life.

The purpose of this report is to fully understand the barriers that may slow or prevent further developments in the industry. The purpose of the report is not to present specific solutions but to provide a solid basis for further work.

Defining Recyclability of Flooring

Within the context of flooring, unavoidable waste is material that may contain additives that were permitted at the time of manufacture, but are now restricted in today's markets. This is especially true for legacy vinyl flooring which may contain banned or restricted stabilisers and plasticisers.

Zero Avoidable Waste incorporates the need to reduce, re-use and then recycle. Achieving these is unique to the product and the material that the product is made from. Often, they are not mutually inclusive, and increasing a product's lifetime or performance may make it less "recyclable".

Recyclability is a complicated characteristic, and when considering a highly engineered product such as flooring it becomes even more difficult. There are different levels to recyclability, with a distinction needed between a product's technical ability to be recycled, and the infrastructure which enables it to be practically recycled.

Technical recyclability is defined by whether the product or material can be used back into the manufacture of new items. Even within the definition of technical recyclability there are two basic levels:

- **Recyclable in closed loop applications**
- **Recyclable into alternative products**

Closed loop recycling is often the aim, as it returns the material to the same product it came from, directly replacing virgin materials. Recycling the product into alternative applications can still have a positive environmental impact but is often less desirable.

Practical recyclability is directly linked with infrastructure. Products can only be considered practically recyclable if the person disposing of the material has easy access to a recycling route. This means that close co-operation between the different parties involved in delivering the recycling route is required to collect the material, sort it and then recycle it either into an open or closed loop application.

The value of the material at end of life is also very important. If the material has no value, then recycling infrastructure will not be developed. Often the value of recycled material depends upon which raw material it can displace. For example, if a recycled polymer can directly replace virgin, it will have a value close to that of virgin polymer. If however the recycled material must be used in lower

grade applications, for example as a filler, then it will displace the cost of using something like a mineral filler.

Alternatively, markets may develop to “make use of” a certain recyclate or waste material. In this case, the value is linked to the value of the product. Such an example would be traffic management products. These can make use of waste PVC in ways other markets cannot, and so the value of the waste is linked to the value of the product and the cost of alternative disposal such as landfill.

Zero Avoidable Waste will only become reality if the entire supply chain within the Construction and Demolition sectors work together.

Flooring Industry Material Flows

Materials flows within the flooring industry are complicated, and in order to move towards Zero Avoidable Waste, more infrastructure and new supply chains will be required. Figure 2 shows the flow of flooring material with potential recycling and re-use options. This is a generic flow for any flooring waste in the contract sector.

The green lines show manufacturing waste, the blue shows waste from the fitting process (i.e., offcuts and surplus material), the yellow shows uplifted flooring and the red flooring that is left in a building that is demolished.

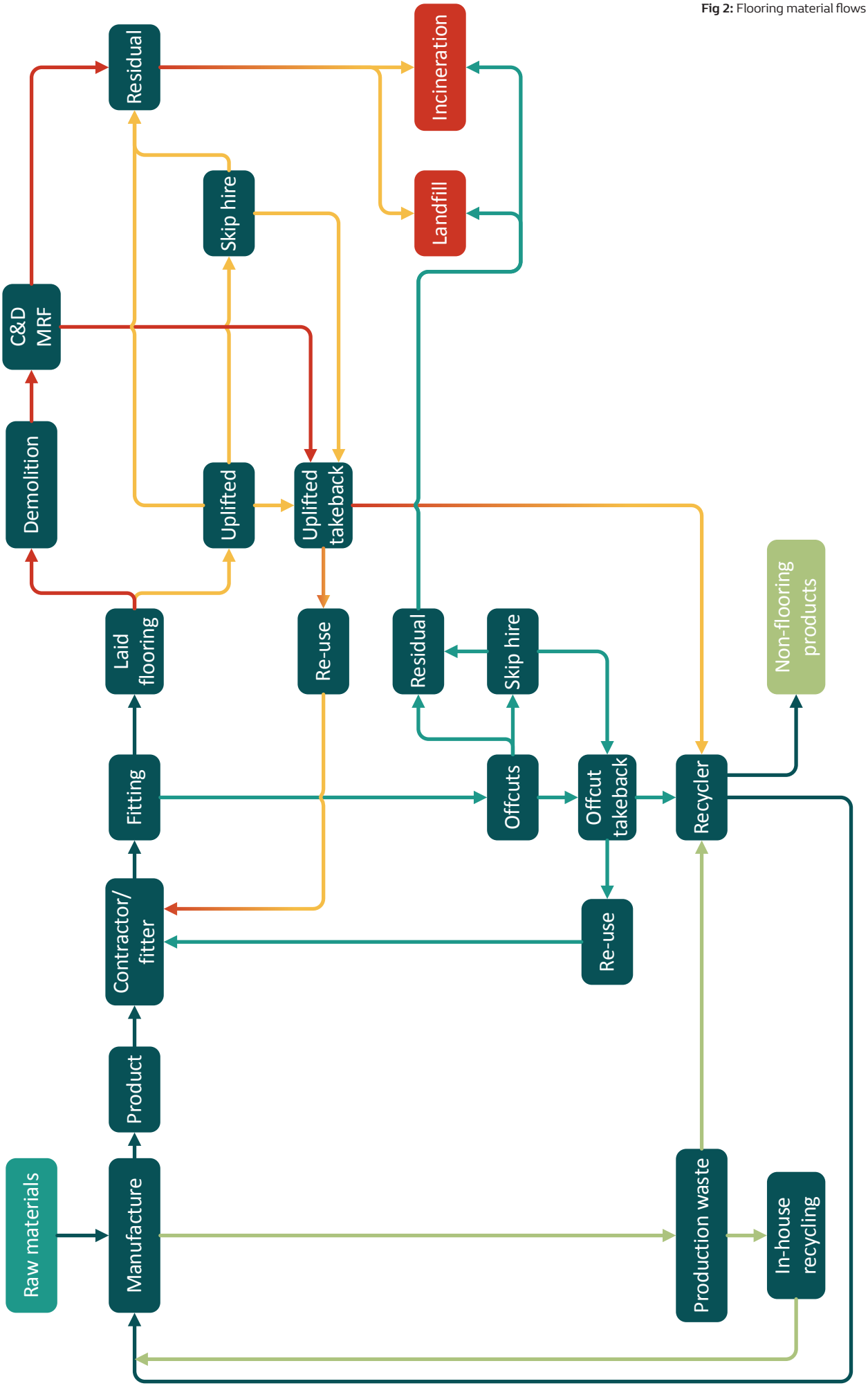


Fig 2: Flooring material flows

Manufacturing Wastes

During manufacturing, waste is generated if a material is out of specification or if offcuts are produced when a product is cut to size. Typically, this kind of waste has already been minimised, as it can be directly linked to the cost of production by the manufacturer. Methods of reducing process waste include:

- **Internal recycling of offcuts directly back into the product**
- **Advances in cutting technology to ensure maximum product**
- **Light weighting to reduce initial material use**

Fitting Wastes

Once manufactured into a product (e.g., vinyl sheet or tiles), it is then distributed to flooring contractors or fitters who are responsible for laying the flooring.

Offcuts are generated along with surplus product. Minimising offcuts is driven primarily through the design of the building, the specification of the flooring and accurate estimating and planning by the contractor for the project.

Modular products such as tiles and wood flooring will produce fewer offcuts as they only need to be trimmed at the edges of a room. The shape of the room will also impact the amount of offcut material, as an irregularly shaped room will require more product to be cut and wasted. Good building design and planning of finishes will again minimise waste.

Clean offcut material may be suitable for re-use or recycling, however the type of recycling will depend upon the design of the product. This material can be captured through existing takeback schemes, alternately, the contractor may place it in a mixed skip or directly into a residual waste collection. The skip hire company may be able to sort and extract the offcuts, otherwise it will form part of their residue. Residue will be either incinerated or landfilled.

Use Phase

Once the flooring is laid it enters the use phase. For flooring, the length of the use phase can vary widely depending on the type of flooring and where the flooring is used. In the UK, flooring is rarely in place for the lifetime of the material and it is changed through a desire to change the design rather than the product having reached the end of its natural life. At the end of life, flooring may be uplifted or might remain in the building as the entire structure is demolished.

End of Life

Uplifted end of life flooring can potentially be recycled, or if in good condition re-used, following a similar path to the clean fitting offcuts.

If the flooring remains in a demolished building, there is the possibility it could be sorted in a Construction and Demolition (C&D) Materials Recovery Facility (MRF). Any end of life material not recovered will be landfilled or incinerated with other residual wastes.

In the domestic flooring market, offcuts and uplifted material are typically disposed of by the householder. If quantities are small they may dispose of it in their kerbside residual waste, or at a Household Waste Recycling Centre (HWRC). The HWRC will typically have a wood skip in which solid wood flooring could be placed, and in some cases will have a carpet skip.

The carpet collected in the skips is often very low quality material. The skip will be a mixture of all different types of carpet, and the carpet will often be contaminated. As a result the material collected at HWRCs is most often incinerated with energy recovery, or in some instances turned into a fuel product. This is discussed more in the carpet section of the appendices at the end of this report. Vinyl flooring disposed of by householders will be disposed of in the residual collection at the HWRC.

There are three main points within the material flow where Zero Avoidable waste must therefore be applied:

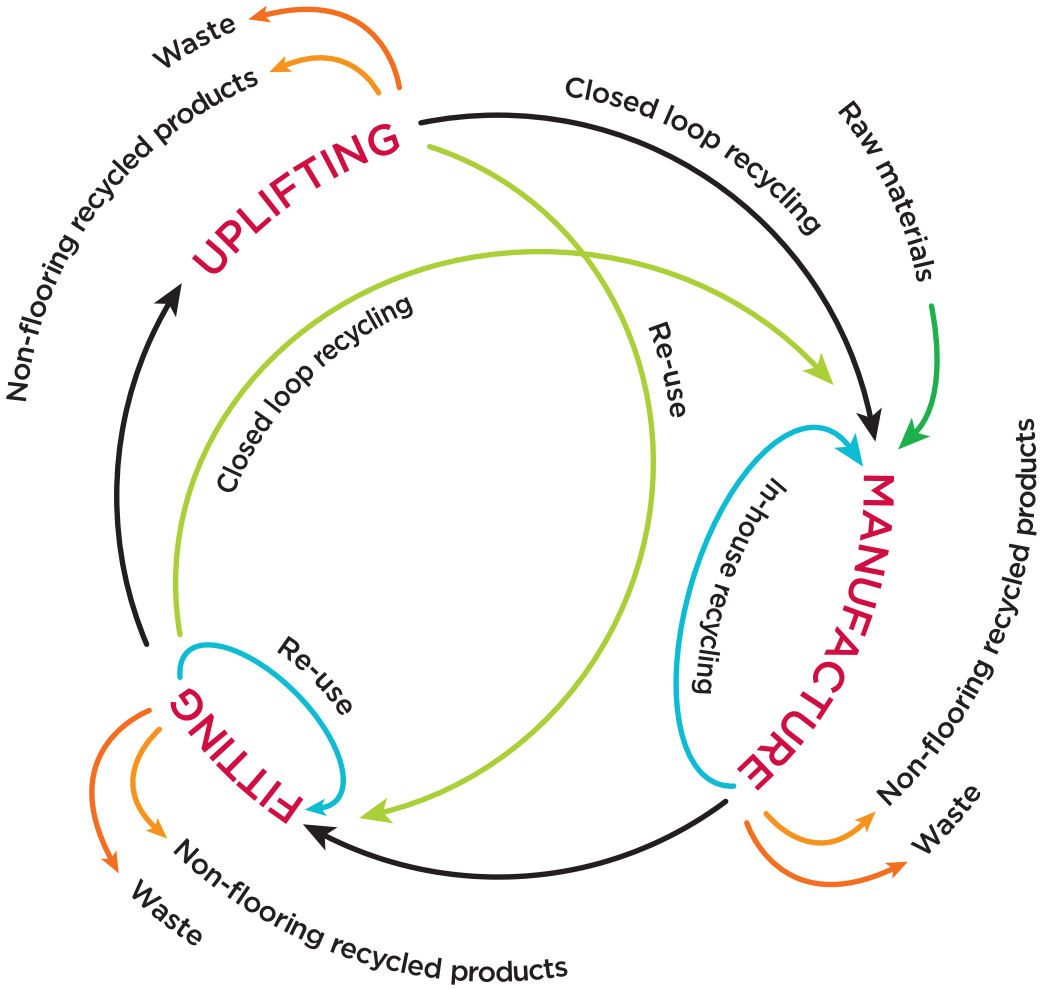
1. **During the manufacture of the product.**
2. **During the fitting of the product.**
3. **At the end of life of the product.**

At each stage, the waste hierarchy can be applied. However, the ability to move up the hierarchy depends upon two main factors:

- **The design of the product to enable it to be re-used or recycled; and**
- **The infrastructure to collect, sort, redistribute or recycle the product**

Figure 3 shows how the waste flows in the flooring sector. The internal flows should be maximised with the external flows minimised.

Fig 3: Waste flows in the flooring industry



Key Barriers Towards Zero Avoidable Waste in the Flooring Sector

Flooring is a highly engineered, demanding product. The performance of the product cannot be compromised, and this has led to the creation of complex structures. Recyclability and re-use models have become more of a focus within the flooring industry but there are many opportunities to move further towards Zero Avoidable Waste.

The proposed plan is independent of the type of flooring and it is not recommended that at this stage an individual plan is made for the different types of flooring. This is because the fundamental barriers are the same regardless of the material and format. The solutions to address those barriers will be unique, but the entire flooring sector should have a common, clear goal.

Manufacturing

Significant progress has already been made in this area. Systems have been optimised so that manufacturing waste for all flooring formats can either be recycled in a closed loop system, recycled in an open loop system or where this is not possible recovered and used for energy generation.

The optimisation for the management of in-house waste is possible because it is in the direct control of the manufacturer. This contrasts with all other parts of the products lifecycle in which the manufacturer does not have direct control.

One area that can be improved upon is being able to recycle as much production waste as possible into the highest value product. The barrier that will prevent this is the design of the flooring. If it is not recyclable, then it will have to be used for energy recovery.

Fitting

Once the flooring has been distributed and is fitted, offcuts and surplus material may be generated. In this case, the material is typically clean. Re-use is the optimal solution for any surplus material. The level of material generated at the fitting stage that would be suitable for re-use is likely to be quite low. There are many re-use schemes which will take tile products that are surplus to requirements. The barriers to enabling more re-use are:

- **Knowledge of re-use schemes: There are a wide number of companies, including manufacturers, who will enable the take back of carpet tiles for re-use. The barrier is that contractors and fitters may not be aware of the schemes or have space on site to facilitate segregation.**
- **Waste management at construction sites: Collection for re-use will require clean, uncontaminated material to be collected. In the case of modular flooring products, these can be stored on a pallet to be collected. Alternatively, the contractor can take the tiles back to their own site for pick up.**

Recycling of the offcuts is the next best method of achieving zero avoidable waste. There are several barriers to consider here:

- **Design of the product: The product must be designed in such a way that it can be recycled. If products can be recycled in a closed loop, they will likely have a higher value at end of life.**

- **Availability and knowledge of collection schemes: Collection schemes exist for vinyl flooring and carpets but not for wood waste. These collection schemes are not always utilised to their full potential.**
- **Waste management at the construction site: Segregation and collection of multiple waste streams from construction sites is not well established. Often with several contractors on site, and with waste management not being a key concern, offcuts are placed in general waste skips.**
  - ◊ **Contractors can take offcuts back to their own premises which is common within Recofloor, but to capture greater quantities of material, collection must be implemented at site.**
  - ◊ **Contamination becomes a big issue when attempting to source segregate, and space is also an issue. With the waste management often being provided by a different contractor to the flooring fitter, establishing the relationship to ensure flooring is collected can be challenging.**

The recycling of offcuts must be optimised. Modular installation wastes account for between 2 and 4% with sheet estimated to be up to 8% of wastes generated. The material is a known composition and so, providing it has been designed so that it can be recycled, the focus should be on collecting this as it represents the "low hanging fruit".

Uplifted/End of life

Uplifted and end of life materials are more challenging than offcuts. This is because the material composition may not be known and there can be contamination from adhesives and from the use of the product (i.e., dirt, grit). Re-use again is the best option, but it is not without its barriers:

Design: Only good quality material can be re-used. This can be influenced by the design of the product, to make a hardwearing flooring. Loose lay products which are relatively new to the market will facilitate re-use as it can be uplifted without damage to the product and without residue that would need to be removed. Adhesives that also facilitate a "clean" uplifted product have also been developed.

- **Availability of collection schemes: Carpet tile collection schemes are available for re-use, and the large quantities generated through uplifting material makes it an even more attractive prospect for the re-use organisations**
- **Waste management at demolition or refurbishment sites: As with construction, the waste management at the site can be a challenge. However, if being collected for re-use, the tiles can be placed on a pallet to be collected. This requires planning from the flooring contractor. If a property is being demolished, extracting the material before any demolition work takes place is vital.**

Material that cannot be re-used should be recycled where possible. This brings additional barriers:

- **Design: The product must be recyclable, with closed loop recyclability as a preference. Uplifted material will often have been stuck down which decreases the potential for re-use and also the recyclability of the product.**
- **Knowledge of the product: This is possibly the biggest barrier to recycling**

of uplifted or end of life products. Some materials used in legacy flooring are now restricted, and so cannot be recycled back into flooring. There are some options to recycle products back into open loop applications such as traffic management products (vinyl) or equestrian surfaces (carpets), but care must still be taken. Without detailed information on the product, an informed decision as to how to handle it cannot be made.

- **Availability of collection schemes: The collection schemes in place focus on offcuts, due to the higher level of recyclability and known material composition. Those that accept end of life carpet material often have minimum collection volumes which are too excessive for smaller contractors to take advantage of and delivery of the material to the recycler by the smaller contractors can be uneconomical.**
- **Waste management at demolition or refurbishment sites: During refurbishment the old flooring must be removed. This is an opportunity to capture the waste, especially if it's the case that only the flooring is being changed. In the case of demolition, its currently very unlikely flooring would be uplifted and separated if there is not seen to be any value.**

Domestic Disposal

Disposal from domestic installations and uplifted domestic flooring is considerably different. In some cases, contractors may be able or willing to take waste back to their site, but in the majority of cases it is for the householder to dispose of the flooring.

The challenge here is much more around what is possible from collections at the Household Waste Recycling Centre (HWRC). In this instance, a householder would bring back uplifted product (potentially heavily contaminated) and offcuts or surplus flooring. For wood-based flooring all HWRCs would have a wood skip, and so any wood flooring can be recovered or recycled.

Recycling of carpet and vinyl material collected from a HWRC is very challenging even if there is separate collection. Having a collection of uplifted and offcuts separately would be unlikely to work well at a HWRC where the public is relied on to separate material correctly.

Therefore the main barriers are:

- **Separate collection at HWRCs, even if the end destination is recovery rather than recycling**
- **Ensuring householders use the collection correctly and do not contaminate them with non-flooring materials. This is a communication issue.**

Product Lifetime

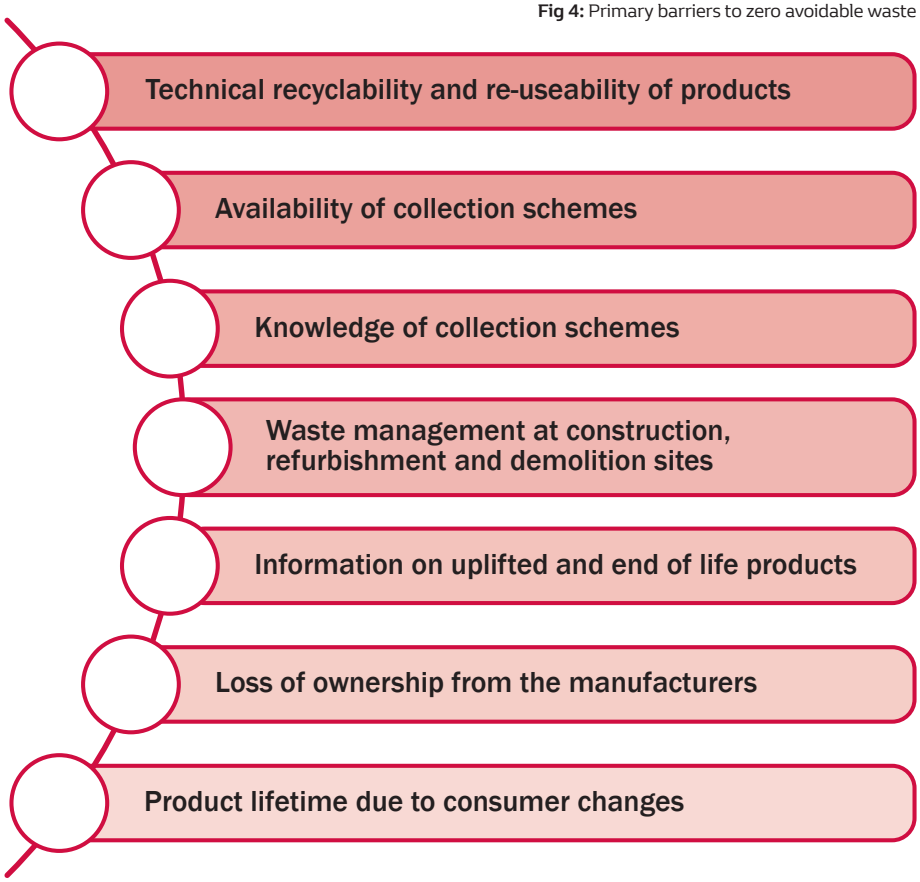
A final barrier that is faced by flooring is the product lifetime. Often, flooring is not changed because it is not fit for purpose, it is far more often changed because the customer (contract or domestic) wish to have a different design.

The product itself may be able to last for over 20 years, but on average is in place for less than 10 years (depending on the type of flooring and where it is used). This means that waste is generated at a greater rate than is needed, and the manufacturers cannot easily influence this. The decision maker in this case is the consumer. It also raises the question of who is responsible for generating that waste when considering Extended Producer Responsibility (discussed in later sections).

Summary of Barriers

Figure 4 summarises the primary barrier that flooring is facing which currently limits zero avoidable waste.

Fig 4: Primary barriers to zero avoidable waste



These barriers can be expanded on:

- **Technical recyclability and re-usability of products: This is entirely dependent on the design of the product. Without the technical ability to recycle or re-use the product, no systems can be put in place to move to zero avoidable waste. This is within the control of the manufacturers to some degree, but limitations on achieving product performance with a recyclable design can be challenging in flooring.**
- **Availability of collection schemes: Collection exists for some products and not others. The schemes are all managed and funded by manufacturers. If there is no collection scheme in place this means even if a product is recyclable, it will not be practically recycled. There is also a barrier to the lack of disposal options for the householder for carpet and vinyl (although some HWRCs do offer carpet collection).**
- **Knowledge of collection schemes: People can only use schemes if they know about them. Existing schemes are well publicised within the flooring sector, but may be less well known in the waste and construction sector.**
- **Waste management at sites: A major barrier is the ability to implement source segregation at construction sites. The number of contractors and subcontractors makes implementing separate collection a challenge.**
- **Information on uplifted and end of life products: If the make-up of a product is unknown and if there is a chance it contains restricted substances; this will limit its recyclability. Recyclers and manufactures often must assume the worst-case scenario, and are unable to realise the full value of the material even if it can be collected separately.**

- **Loss of ownership from the manufacturer: This is a less tangible barrier. One reason manufacturing waste is recycled is because it is within the direct control of the manufacturer, and has a direct influence on their costs.**

These barriers cannot be overcome by the flooring manufacturers alone. To achieve Zero Avoidable Waste, the construction and waste management industries must also make fundamental changes in the way in which they operate. If the other industries are not able or willing to make these changes, it will prevent re-use and recycling, and legislation may be needed.

High Level Opportunities to Achieve Zero Avoidable Waste

The barriers can be converted into opportunities available to achieve Zero Avoidable Waste. In this scoping study, potential opportunities are highlighted. They are not at this stage recommendations to the industry, but instead areas where focus can be placed and more detailed plans of action created.

The opportunities have been grouped into four areas which can be seen in Figure 5.

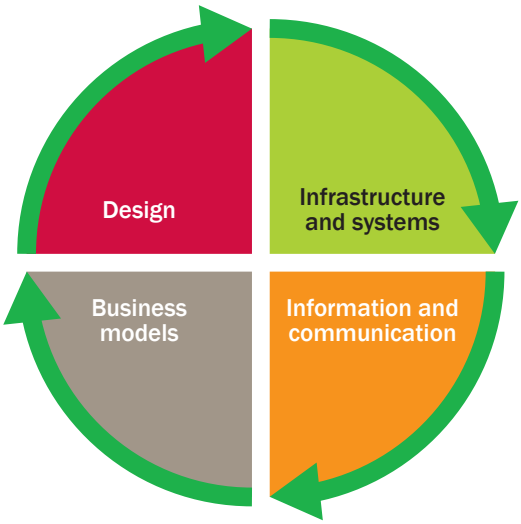


Fig 5: Opportunities for Zero Avoidable Waste in the flooring industry

Design

Design is the area in which the manufacturers have the most influence. The design is a key element that allows for re-use and recycling at end of life. However, minimising material use in the first instance is also important for the circular economy. These three factors can be depicted as a Venn diagram, with the optimum position in the middle of the diagram.

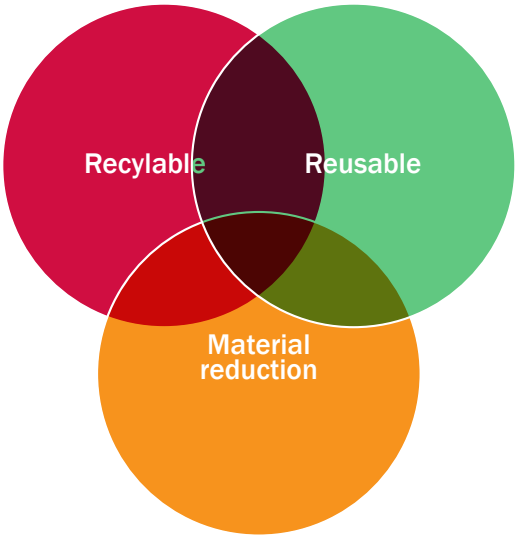


Fig 6: Design constraints

Material Reduction

Material reduction is the highest tier in the waste hierarchy. Using less material is not only positive for the environment, but makes economic sense for the manufactures. to this end products have typically been optimised within the flooring industry to minimise material use, while still maintaining performance.

Design for Re-use and Recyclability

- **Recyclability and re-usability may not both be able to be achieved in a single product and certain products are more likely to be re-used than others**
- **Modular products such as carpet tiles, LVT and wood flooring are far more suitable for re-use than sheet products (vinyl, rubber, broadloom carpet)**
- **Re-use is not an "end of life" option. End of life options are recycling, recovery or disposal. Products that cannot be re-used should retain the highest possible value when recycled.**

Figure 7 shows where each product should fit into the waste hierarchy, and where the focus on design should be. For re-usable products, recyclability is also very desirable, but ensuring the longest lifetime can be achieved in its original form should be the aim. Re-use also has significant social benefits, allowing access to products for more consumers.

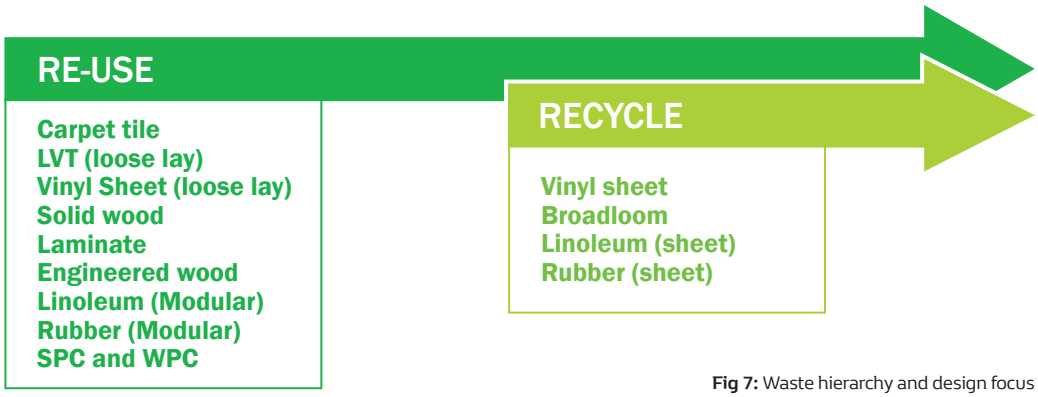


Fig 7: Waste hierarchy and design focus

Changes in design have already been carried out to improve recyclability and re-usability and have been highlighted in the specific flooring sections in the appendices of this report.

Where a product cannot be recycled, incineration for energy recovery remains the preferred method of disposal and can also be defined as a hierarchy as shown in Figure 8.

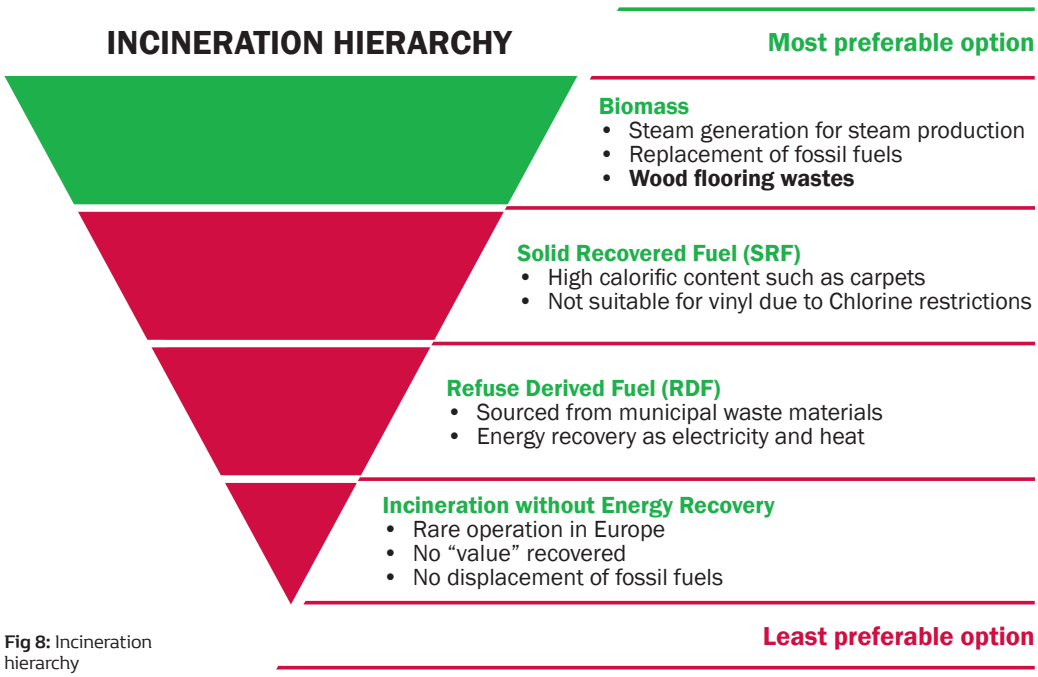


Fig 8: Incineration hierarchy

Design Opportunities

The specific opportunities from product design are:

- **Adhesive free or loose lay products are already available in the market. Further adoption of these will help to reduce the level of contamination at end of life and allow for easy uplifting. It should be noted however that adhesive can play a vital part in performance and so a balance is needed.**
- **Adhesive that comes away from the flooring clean to minimise residue**
- **Single polymer products, e.g., all Polypropylene (PP) carpet**
- **Compatible materials, e.g., not using a combination of wood and PVC.**

Manufacturers may need additional incentives and resources to ensure the maximum number of products are designed for re-use or recycling. This could include:

- **Best practice guidelines for design could be created to provide manufacturers with the information needed to make design choices. Central membership organisations, such as the CFA, could create and distribute guidance for the best practice in designing flooring for recyclability and re-use. This guidance can also be used as evidence the sector is achieving design best practice.**
- **Legislation could also be used to ensure manufacturers are maximising recyclability and re-usability. Extended Producer Responsibility (EPR) could be a tax linked to whether or not a product is recyclable or re-usable. The purpose of this report is not to suggest different EPR mechanisms, but the concept of linking a tax to how "recyclable" a product is should be highlighted. Any taxation could then be used to help fund and run the necessary infrastructure to ensure products are re-used and recycled. One major issue is the intended purpose and lifetime of the product may considerably exceed the actual lifetime of the product. Ensuring material can be re-used or recycled on a technical basis is only part of the issue. Infrastructure and systems must also be in place to enable practical re-use and recycling.**

Collection Infrastructure

Different flooring products are at different stages with regards to the existing infrastructure. Current systems rely heavily or exclusively on the fitter to return offcuts or surplus material to a distributor or to a manufacturer. In the case of carpet tile re-use, for large quantities of products the re-use organisation may collect the product.

In order to re-use and recycle large quantities of material and move to Zero Avoidable Waste, some drastic changes in infrastructure and systems are required.

In order to understand the opportunities for collection, where the waste is generated and by who must be understood. This can roughly be divided into commercial and household

Commercial

There are three ways in which flooring waste will be generated in a commercial environment:

- **During construction fit out**
- **During refurbishment**
- **During demolition**

The key in all these instances is to have a separate collection on site for any and all types of flooring. This is a simple statement, but could be very difficult to implement because:

- **Waste management at the sites may be subcontracted, or the responsibility of the main contractor**
- **Current cost of flooring waste management may be minimal in the wider project budget and therefore little incentive to be managed separately**
- **Separate collection raises the impracticality of having a large number of collection "bins" for all different types of products, and so there has to be some fundamental shift in the way waste is managed**

An effective dialogue must be established with the construction industry, to fully understand the barriers to implementing separate collections. Current systems rely on the manufacturers covering the majority of the cost of collection and transport. If an EPR model was to be introduced this may be a way of covering the cost across the industry. Otherwise, it may be mandated or legislated that anyone who sells flooring must also provide collection from the construction or demolition site.

Domestic Collection

Flooring wastes are typically left with the householder to be disposed of through one of two routes:

- **Kerbside collected residual waste**
  - ◊ **No chance of re-use or recycling. Disposal through incineration or landfill depending on LA contract.**
- **Household Waste Recycling Centres (HWRC)**
  - ◊ **Textile flooring**
    - — **Carpet: Potential that HWRC may have carpet only skip. Heavy contamination prevents re-use and recycling in most cases. Material is typically sent for energy recovery via incineration.**
  - ◊ **Resilient flooring**
    - — **No separate collection at HWRC due to low volumes and space restrictions. Material is typically disposed of in residual skip.**
  - ◊ **Wood flooring**
    - — **Separate collection is typical as part of the general "wood waste skip" and can be sent for either recycling or energy recovery**

Substantial changes at the HWRCs would be needed to capture more material for recycling or reuse from the domestic environment. The inclusion of carpet waste collection should be expanded in the UK because of the existing reprocessing market.

Processing Infrastructure

There is limited processing infrastructure to recycle flooring. There are companies who can shred carpet for use in equestrian surfaces, and there is significant capacity for the recycling of vinyl products.

The shortfall is in the infrastructure to bulk up and then sort waste flooring. If more recycling is required, centralised hubs where flooring can be sent for sorting and some processing (e.g., shredding) may be required. Existing systems rely on manufacturer's facilities which may not be optimised to be waste management facilitates.

If EPR is introduced, this money could be used to create hubs across the UK where flooring can be sent for sorting and processing. Without EPR the cost of these facilities would be prohibitive.

Information and Communication

Existing schemes are not always used because contractors or construction companies may not be aware of them. Increased communication of existing schemes by the industry may help to increase the rate of collection for materials that are already targeted.

In addition to having information on the available collection schemes, more information about what products are in a commercial building and how they can be managed at end of life needs to be available. One method of this could be to increase participation in NBS's digital platform for building specification,[3] incorporating more product information into the Building Information Modelling (BIM) system. This will facilitate better management of the materials at end of life.

Building Information Modelling is a process for creating and managing information on a construction project across the project lifecycle. One of the key outputs of this process is the Building Information Model, the digital description of every aspect of the built asset. This model draws on information assembled collaboratively and updated at key stages of a project. Creating a digital Building Information Model enables those who interact with the building to optimize their actions, resulting in a greater whole life value for the asset.[4]

Cabinet Office and BEIS have been implementing a long-term programme to embed the use of BIM across centrally procured public construction projects. Local Government construction clients are now adopting BIM in increasing numbers as they too see the benefits derived from data-enabled ways of working.[5] BIM covers the three primary spatial dimensions of a construction project (width, height and depth) as well as time (4th) and cost (5th). BIM may also be extended to include two more levels; sustainability (6th) and facilities management (7th) where the sourcing of material and its composition are logged in the BIM allowing for contractors and demolition companies to plan for the removal and recycling of material.

Business Models

The Circular Economy is not only about optimising re-use and recycling systems, but also about fundamentally rethinking business models to maximise how long materials remain in the economy at the highest possible value.

Developing new business models is challenging and cannot be implemented overnight. The aim of any new business model would be to retain a level of ownership of the product, so that the manufacturer can have control over the end of life. Methods in which this could be achieved may include:

- **Leasing the flooring and retaining complete ownership of the product**
- **Introducing a deposit system**

3 www.thenbs.com/?from=en-gb

4 www.thenbs.com/knowledge/what-is-building-information-modelling-bim

5 https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/34710/12-1327-building-information-modelling.pdf

Product Leasing

Leasing a product would mean that the manufacturer, or distributor, retains ownership, and the customer pays a fee over time. The leasing model may cover replacement of the flooring at the end of an agreed lifetime (for example 10 years). This may be suitable for large installations such as schools or hospitals that will keep the same flooring for a long period of time. At the end of the lease or during replacement, the manufacturer or distributor would be able to capture all uplifted material and any offcuts. This can then be recycled or re-used in the most optimal way to reduce the cost the manufacturer or distributor will incur.

An alternative leasing model may be a short-term lease. This could be for applications where the flooring will be in place for a short period of time, before being replaced. An example of this may be the fitting out of a newly built office block. The building may have a flooring installed when finished, but new owners/tenants may wish to immediately replace the flooring. The flooring could therefore be leased to the construction company, with an option for an extended lease or removal of the flooring.

Deposit System

A leasing model would retain entire ownership of the product. An alternative method of retaining some level of ownership of the product is through a deposit. This incentivises the end "consumer" to return the flooring to the manufacturer when they have "used" the product.

The customer would pay a fee, which is returned once the product has been collected by the manufacturer. Distributors could also be used as a middle-man, especially in the case of domestic flooring where return directly to a manufacturer is unlikely to be realistic.

With a deposit system the cost of collecting and moving around small quantities of material could be challenging. The manufacturer would also need outlets for the material once collected. A blanket deposit across all flooring in all applications is unlikely to work, although it could be used in installations over a certain area.

How the deposit is passed on from one owner of the flooring to another would also need to be considered, and how the deposit is held and controlled is also of importance. The basic concept of a deposit could go some way to retaining ownership, but there would be a number of barriers to address before it could be adopted.

Specific Opportunities by Flooring Type

For each flooring type covered in this scoping study the primary opportunities for moving towards a more circular economy have been summarised below. Further detail can be found in the appendices for each category.

Textile

- **Continued improvements in manufacturing processes and increase in recycled content**
- **Continue the development of products designed for recycling and re-use such as moving towards single polymer products which are easier to disassemble or selecting products based on circular credentials**

Moving towards new business models which offer new leasing or takeback solutions for recycling at end of life.

Resilient

- **Further the adoption of existing collection schemes through increased communications**
- **Enable recycling of uplifted flooring and the collection of LVT products for re-use through the development of adhesive free or loose lay flooring techniques where appropriate**

Wood

- **Implementation of circular business models by manufacturers to retain ownership of their products and facilitate takeback for re-use and recycling**
- **Increase the awareness of community based social enterprises specialising in the re-use of wood flooring**

Prioritisation of Opportunities

A number of opportunities have been presented above. Not all of these can be implemented in the near future, and some may have more impact than others.

OPPORTUNITY	ORGANISATIONS INVOLVED
Increased awareness of existing schemes	Build UK, CFA Individual schemes (e.g., Recofloor, back to the floor)
Opening dialogue with construction industry to encourage schemes to be implemented at site level	Build UK, CFA, CPA
"Green procurement" to ensure any public building being built or refurbished makes use of collection and recycling schemes	Build UK, CFA, CPA, local government, DEFRA
Establish a re-use scheme for Luxury Vinyl Tile (LVT)	LVT manufacturers
Work with government on potential EPR scheme linked to product re-usability or recyclability	CFA, manufacturers, DEFRA
Publish guidance on best available practice for flooring design	CFA
Understand how end of life can be incorporated into BIM	Build UK, CFA, CPA
Engage in closer collaboration with the Green Construction Board with regards to the development of their ZAW route map	CFA, GCB

To progress the above, the following work could be undertaken:

- **Quantify waste arisings: This is a very difficult task to do accurately, as waste data and data codes do not allow for this. Although there are estimates for the quantity of waste in this report, more accurate figures could aid targets and tracking progress. There is a focus in the waste**

industry on improving the transparency of waste data, but collecting accurate data could still be very challenging.

- **Fully understand volumes and capacity of reuse and recycling schemes:** Current schemes are operated largely by individual manufacturers and so there is often an element of commercial sensitivity regarding recycling and re-use data. It is also unclear as to the maximum capacity of existing schemes, and at what point additional infrastructure and funding would be needed.
- **Gap analysis on recycling and re-use schemes:** If accurate data can be collected on waste arising and the capacity of existing schemes, a gap analysis can be carried out to understand what needs to be done to capture as much material as possible.
- **Pros and cons on alternative business models:** A more in-depth study could be carried out into how different business models could impact the industry and how effective they may be at moving towards Zero Avoidable Waste. The economic and technical feasibility of alternative business models at scale would need to be considered.

Conclusions and Recommendations

This study has shown that for the three categories of flooring investigated (textile, resilient and wood), progress has been made over the last ten years with regards to sustainability. Design for recycling and reuse is a clear focus of the sector, with much work already done to optimise material use and reduction of waste during manufacturing.

There are collection and recycling schemes for broadloom, carpet tiles and vinyl sheeting from contractors. These schemes are often cheaper than landfill, and it is for the contractors to ensure collection schemes are used wherever possible.

Although recycling and re-use schemes exist, the quantity of flooring that is re-used or recycled remains low. There are a number of barriers which contribute to this that have been explored in this study. Collaboration outside of the flooring industry is key if Zero Avoidable Waste is to be achieved. Additional economic drivers such as Extended Producer Responsibility (EPR) may be necessary to ensure the “business case” for Zero Avoidable Waste is favourable.

The next stage will be for the industry to formulate a specific action plan on how to overcome the barriers presented in this report and exploit the opportunities that have been highlighted.

Product Profiles

Textiles

Carpets are composite materials used widely in both domestic and commercial premises. The pile fibres, pile weight and backings are the key factors controlling wear performance, but they also have a major impact on the disposal route at the end of the carpet's life. Carpets produced by tufting account for the largest product segment, which is largely due to the ease with which they are produced. Manufacturers of tufted products use natural fibres such as wool but the use of synthetic materials such as polypropylene, nylon and polyester are also common.

Woven carpets are the second largest product segment. However, the growth of tufted carpets negatively affected the demand for woven carpets. Both the tufted and woven products are generally favoured for the residential markets and are produced in standard sized roll form (Broadloom).

Needlefelt carpets are also popular products due to hardwearing and long-lasting design credentials and are typical favoured for office and retail spaces due to the high foot traffic. For such outlets carpet tiles are generally preferred.

Tufted Carpets

Carpets and rugs produced by tufting are the largest product segment in the industry, accounting for 79% of the industry's overall revenue in 2017/18. This is mainly due to the ease in which the product is mass produced compared with other carpet types. Pile yarns are usually tufted into a polypropylene primary backing and then locked in place using synthetic rubber-based latex adhesive. A secondary backing fabric of either jute or more usually polypropylene is applied to impart strength and dimensional stability to the carpet.

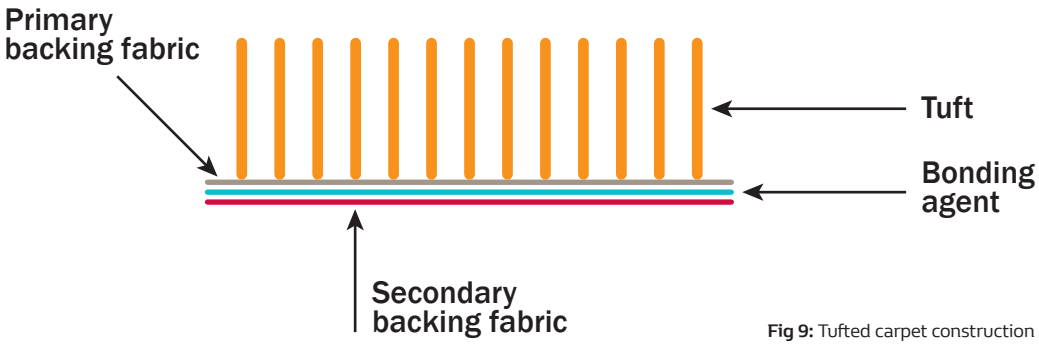


Fig 9: Tufted carpet construction

Tufted carpet pile yarns can be made of wool, polypropylene, nylon or polyester. Pile yarns can also utilise fibre blends (either 100% wool or a blend of 80% wool with 20% synthetic fibres and variations of these proportions). Tufted carpet waste would usually arise from domestic residences and commercial buildings.

Tufted carpets can be broken apart for recycling and the fibres removed for re-use in other products such as felts for carpet underlay (installation offcuts only), equestrian riding surfaces, some low grade plastic products and fuel for energy from waste — the synthetic fibre content offers a high calorific value.

Woven Carpets

These carpets utilise traditional weaving processes such as Axminster and Wilton constructions. by using coloured pile yarns a wide range of designs can

be produced. The woven construction uses warp and weft yarns, with the pile yarns securely locked in place by backing yarns.

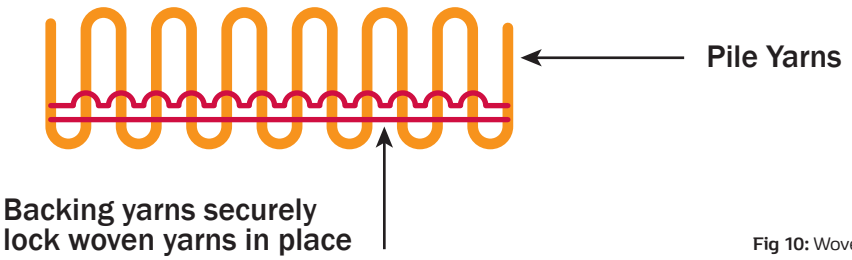


Fig 10: Woven carpet construction

Woven carpets can be highly decorative, very strong and hardwearing, evidenced by their use in airports, hotels and cruise ships worldwide. These carpets tend to be bespoke in their designs and therefore, more expensive to purchase. The pile fibres are normally wool (either 100% or a blend of 80% wool with 20% synthetic fibres) or polypropylene. Warp and weft yarns will be high strength yarns of polyester, polypropylene or jute. Woven carpets are typically domestic residences as well as from commercial properties such as pubs, clubs, hotels and restaurants.

Woven carpets are more difficult than tufted to pull apart for fibre recovery, but the mixed fibre combinations have re-use potential in felts if the appropriate equipment is available. Similarly, to tufted carpets, woven carpet constructions can be used as fuel for power stations and cement kilns.

Needle Punched or Needlefelt Carpets

As the description implies, these carpets are made by producing a web of fibres which are entangled with needles to produce a strong hardwearing material. The web of fibres is bonded with synthetic latex which also increases wear resistance and stability in use. They are commonly used in commercial properties such as offices, shops, schools or hospitals.

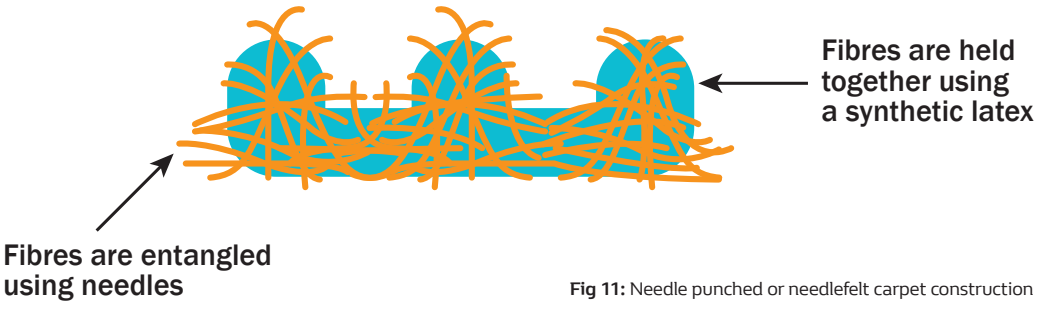


Fig 11: Needle punched or needlefelt carpet construction

Pile fibres are coloured and are either polypropylene or a blend of polypropylene and nylon. The nylon fibres are used to increase wear resistance. No separate backings are used. Typically, these carpets are thinner than most other broadloom carpets.

Needlefelt carpets that are made from 100% polypropylene can be processed to recover fibres for plastics. The polypropylene and nylon blends cannot be processed in this manner as the polymers have different melting points. These blended carpets are therefore generally diverted to energy recovery.

Carpet Tiles

Carpet tiles can be used as an alternative to the more common broadloom, wall to wall or rolled carpet discussed in the previous section. Carpet tiles are formed from an upper layer material or fibre attached to a backing layer, which can be produced in a variety of sizes, colours and patterns. Carpet tiles are generally used in commercial and public buildings where the foot-traffic is high. Carpet tiles are manufactured in both non-adhesive (require gluing) and adhesive (peel-and-stick) styles.

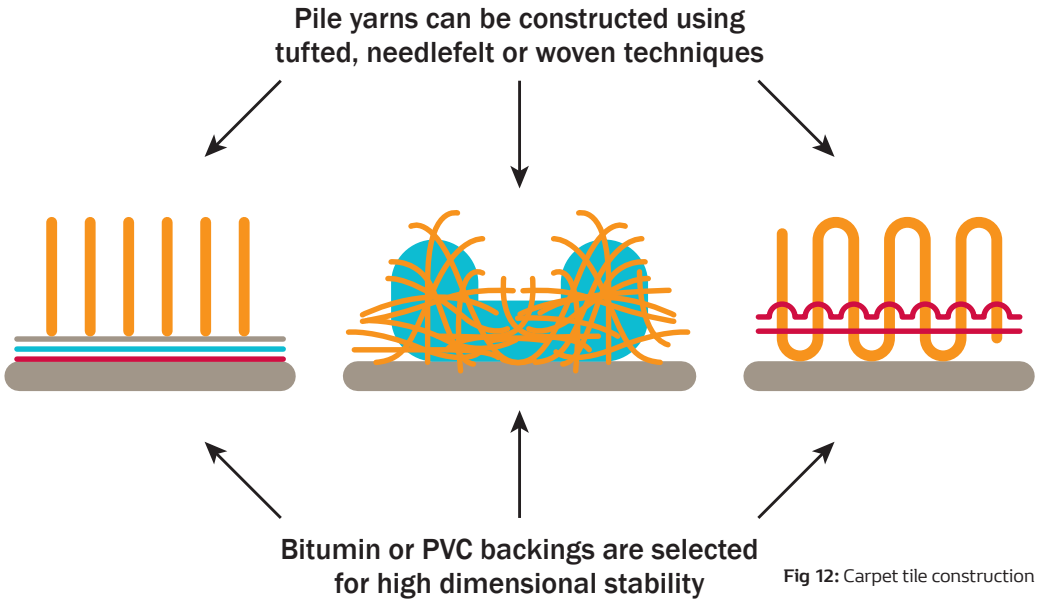


Fig 12: Carpet tile construction

An advantage of tiles is that they can be taken up and re-used, either in the existing building, on the same site or in properties at other locations. Carpet tiles are engineered to perform well in the harshest commercial locations. Often, their design life of 15 years is well in excess of their fashion-led actual life of 7-10 years. This means a second life is well within their asset lifetime.

The pile fibres can be fabricated using tufted, needlefelt or woven techniques and therefore can utilise wool, synthetic fibres or blends in their construction. Tile backings are either modified bitumen or PVC for rigid construction, with resilient backings of felt or polyurethane used for higher underfoot comfort ranges.

Bitumen backing, the main backing type used in the UK, creates specific problems for recycling as the bitumen melts during size reduction whilst reprocessing. However, some bitumen backed tiles do have good calorific value for energy recovery. Bespoke recovery processes by carpet tile manufacturers have been developed to recover nylon pile yarns as well as the bitumen content.

Market, Waste Arisings, Recycling and Landfill Diversion Rate Estimates

Market Size

Over the last five years the carpet and rug industry has remained buoyant despite several uncertainties. The growth has been credited to rising consumer and business confidence. The push by government initiatives has also driven the growth in residential and commercial building construction which has heavily encouraged demand for carpets.

In 2017-18 the industry was set to reach £955.7M[6] with the residential housing and commercial markets accounting for the largest market segments. Figure 13 provides a breakdown by percentage of the total market segments.

2017/2018 Carpet Market Segments

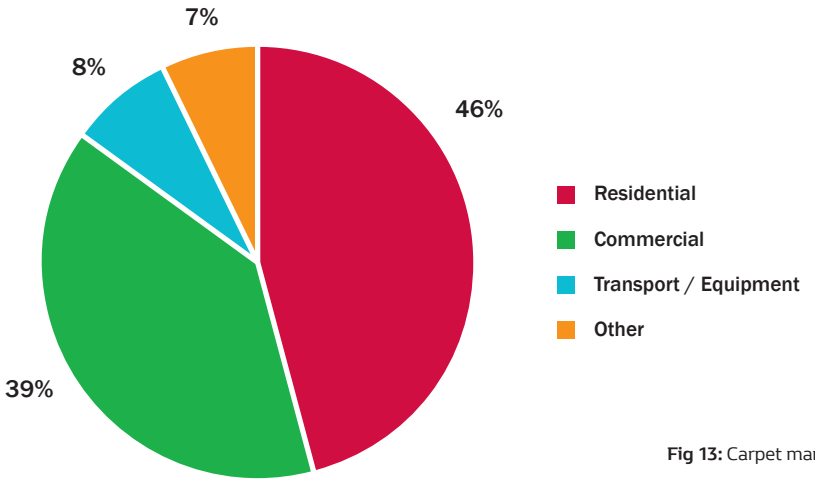


Fig 13: Carpet market breakdown 2017-2018 (source: CRUK 2019)

From Figure 13 above, it is clear to see that the residential market is the largest followed by the commercial sector.

Landfill Diversion Estimates

Since its formation in 2007, Carpet Recycling UK (CRUK) has been collating and reporting on landfill diversion tonnages within the sector. Over the past eleven years it has facilitated the increase in landfill diversion from 2% to 44% (2018) and diverted over one million tonnes of carpet waste otherwise destined for landfill. As part of its commitment to its members and wider environmental sector on an annual basis, Carpet Recycling UK, conducts a market survey of its members and non-member organisations to ascertain annual carpet waste tonnages, where this is broken down into the key re-use, recycling and treatment areas. Due to commercial sensitivity, the information obtained is handled in strict confidence and CRUK only reports back on overall annual figures/ tonnages. This detailed process allows CRUK to report on activities within the sector and developments in certain areas, e.g., re-use.

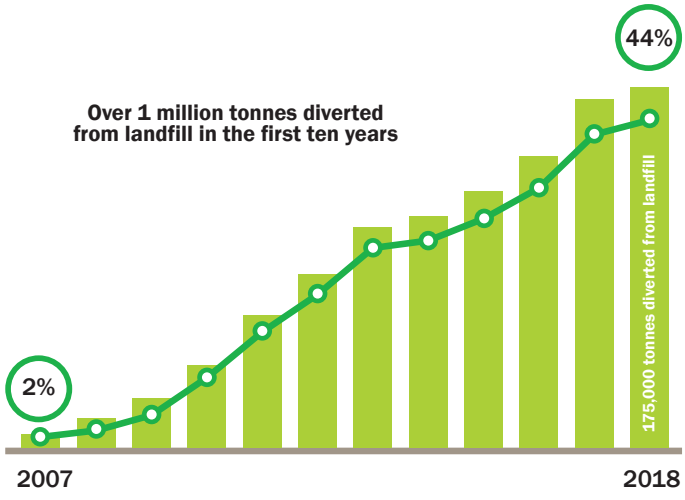


Fig 14: Landfill diversion of carpet waste 2007-2018 (source: CRUK 2019)

6 IBISWorld Industry Report C13.930 — Carpet & Rug Manufacturing in the UK — February 2018

The information is then compared with the previous year where market information and trends are identified. Every year once the data and information are assessed and verified, it becomes publicly available on its website and is passed on through seminars and presentations.

2018 KEY STATISTICS	
Total carpet waste generated in the UK	Circa. 400,000 tonnes
Landfill diversion percentage	44% — 175,252 tonnes
Recovery Rate (Re-use, Recycling and Treatment)	Re-use & Recycling — 35% (61,338 tonnes) Energy Recovery — 65% (113,914 tonnes)
Expected product lifespan	15 years, although most uplifted between 7-10 years
Key design classifications	Broadloom (domestic) and carpet tiles (commercial)

Fig 15: Carpet waste annual data[7]

A breakdown of the 175,252 tonnes diverted from landfill by outlet can be seen below in Figure 16.

2018 Carpet Waste Landfill Diversion Outlets

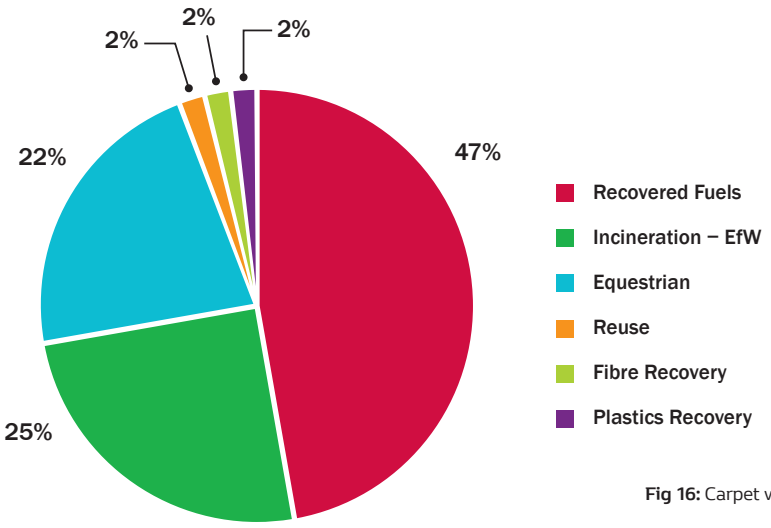


Fig 16: Carpet waste breakdown by applications (source: CRUK 2019)

Waste Arisings

It is estimated that in the UK alone circa. 400,000 tonnes of carpet waste are disposed of through several disposal methods, the majority of which is post-consumer (used) product, with a small percentage of post-manufactured (clean). Depending on the type of carpet used i.e., broadloom and carpet tiles has an impact on which disposal scheme will be used.

For example, broadloom carpets which are used in domestic/residential spaces will tend to be disposed of through either a paid local authority backed collection scheme or the resident taking the carpet waste to its local household

7 Carpet Recycling UK 2019

waste disposal centre. The onus is on the householder normally to dispose of the old carpet unless the carpet supplier offers take back. For carpet tiles which are used more in non-domestic settings, the common disposal methods tend to be either through a skip-hire arrangement or as part of a take back method through the flooring supplier, arranged at tender stage in conjunction with some carpet manufacturers or carpet tile re-use members of Carpet Recycling UK.

Before we discuss the existing re-use, recycling and landfill diversion schemes, it is important to note that the carpet material used, structure and condition are key factors in determining the second-life application of the products. Both broadloom carpet and carpet tiles are usually designed for long-life usages, whereas in reality and due to various reasons, most carpet products are uplifted after 7 to 10 years. Other reasons for early uplift include commercial re-branding, refurbishment and change of use or tenancy. Therefore, by lifting the products up halfway through its life and especially where commercial carpet tiles are concerned there is room for a second life, through a re-use scheme for example.

A key growth area over the last couple of years has been the re-use of carpet tiles and in some cases, resale of broadloom carpets.

Commercial companies offering large volume of unused broadloom rolls often struggle to find a sustainable re-use outlet due to the volume. Working with charities has been found to be slow and not the ideal solution. If there is a charity with a hub that can accept volume and feed these rolls to the smaller outlets, that would be advantageous in increasing broadloom re-use.

More and more carpet tile manufacturing companies have identified the social value that can be gained through donating carpet tile products that have not been sold into the market. Where certain products are being considered for re-use, outlets are identified and these are either given away free of charge, donated to a certain project or passed on for a nominal fee, which allows the outlets to sell them on at a low cost.

In addition, the construction and demolition sector has also identified this level of carpet tile re-use as an opportunity to divert material otherwise destined for skips and landfill, to reduce their impact on the environment and landfill disposal costs (gate fees).

Ultimately, the composition of the carpet product determines its end of life options, where certain materials are just not suitable for re-use or reprocessing through any recycling process and therefore can only be sent to an energy from waste facility. Geographical locations can also influence waste outlet options as the bulky nature of carpets means transporting the material long distances can be inefficient and costly.

The most common outlet tends to be where used carpet products are blended together with other difficult to recycle products and materials to form a fuel product known as either RDF (refuse derived fuel) or SRF (solid recovered fuel) fuel replacement products, commonly used throughout Europe and the world. Both the RDF and SRF products are favoured as they are a replacement for virgin fossil fuels in either a waste to energy plant where heat and power can be generated or in cement kilns, where the residue i.e., ash left from the process can then be used as part of the cement products.

There is continued and growing demand for clean, sorted post-manufacture carpet waste to be used in the manufacture of non-woven products. Traditional

non-woven manufacturers seek specific streams of sorted post-manufacture textile flooring waste to be used in their processes. These companies are long standing traditional non-woven manufacturers who have over time recognised the benefit of using carpet fibres as an alternative feed. Textile flooring/carpet manufacturers and flooring suppliers who are predominantly servicing the house building programme are encouraged to sort and bale specific streams for collection by the non-woven companies. Collection costs are reduced compared to normal carpet waste collections as the non-woven companies use their transport to collect the material, and if the transport is in the right location, costs can be reduced further. This post-manufacture waste has several uses, in the manufacture of e.g., underlays, growing medium and bedding.

Opportunities Towards Sustainability

The textile flooring business is a competitive sector. The carpet industry, as with most other industries is re-evaluating its traditional manufacturing processes and monitoring the impact its products have on the environment. Most companies have researched and, in some capacity, looked into how they can introduce more recycled content within their products, with several producing ranges which incorporate a proportion of recycled products. In terms of recycled content, modular solutions (i.e., carpet tiles) are typically more advanced in including recycled content. Circular solutions can allow for nylon fibres to be recycled in a closed loop application for example.

A number of manufacturers recognise the value of design for recycling in a circular economy and are developing new products and concepts to allow for an easier recycling process at the end of the products life. The aim of some companies is to also offer lease of textile flooring with a view to offering take back and re-entry into the manufacturing process.

Certain manufacturers have developed a take-back scheme which allows them to further demonstrate their commitment to CSR (Corporate Social Responsibility). The take-back schemes allow the manufacturer to take back their old carpet tiles at the point of installing new ones and dispose of them in a more responsible way.

An example of a take-back scheme is the Tarkett DESSO Take Back — Carpet (Refinity® process, 2009) this scheme was set up in 2009 with the aim of taking back 50,000 tonnes of carpet tiles by 2020[8] and has successfully diverted a significant number of tonnes of carpet tile waste. In a key step towards circular economy Tarkett DESSO has recently promoted the opening of their new recycling centre in Waalwijk, creating two streams of materials that can be recycled and transformed into high-quality resources for new products.[9]

Interface are another example of a flooring manufacturer moving towards the circular economy with their ReEntry® Reclamation and Recycling Programme. ReEntry® was started in 1995 and accepts post-consumer Interface carpet tiles, Interface LVT products and other approved flooring products including those of their competitors. As of December 2018, the ReEntry® programme collects over 4,500 tonnes of this material in the US, annually.[10] Interface have also

8 www.desso-marine.com/take-back%E2%84%A2-programme

9 Tarkett press release November 2019

10 www.interface.com/US/en-US/sustainability/recycling/ReEntry-en_US#504444661

developed a glueless backing system in use since 2006 called TacTiles®. One of the advantages of this system is that it leaves no residue on the carpet tiles, facilitating clean uplifting and therefore makes the carpet tile suitable for re-use or recycling.[11]

Under the recently published Resources Waste Strategy for England,[12] the government has set out its objectives over the next 25 years. A key aspect of this strategy is to ensure resources are used more efficiently throughout the UK and products are more durable, repairable and recyclable.

There is a key focus on the circular economy and Extended Producer Responsibility (EPR¬), which focuses mainly on packing products. It is known that EPR is likely to be extended and introduced to other products such as bulky household waste items, which will include carpet and underlay products. Therefore, before any such real intervention by legislation, carpet manufacturers are encouraged to consider design for recycling initiatives. The textile flooring/carpet sector is a competitive market and companies who make the leap by designing for recycling will be ahead of others who choose to wait for legislation and therefore may potentially lose market share in a future market built on the circular economy.

Companies who can diversify and offer new, high performing ranges which include single polymer products, which are easier to dissemble, offer new lease-take back solutions for recycling will be ahead of the game.

It has been long recognised that the marketing benefits of being forward thinking in this sector are high.

11 www.interface.com/EU/en-GB/about/modular-system/TacTiles-en_GB

12 www.circularonline.co.uk/news/defra-publishes-resources-strategy-consultations-response/

Resilient Flooring

Vinyl Sheet, Vinyl Tiles, Linoleum and Rubber

Resilient flooring has been split into the following categories:

- **Vinyl sheet, both homogeneous and heterogeneous, smooth and safety**
- **Luxury Vinyl Tiles (LVT)**
- **Stone Plastic Composite (SPC) and Wood Plastic Composite (WPC)**
- **Linoleum**
- **Rubber**

Vinyl Sheet

This is a sheet product which can be made from between 40 and 100% PVC, with the remainder being fillers or additives. Sheet can either be homogeneous, which is a single layer of polymer, or heterogeneous in which the sheet is made up of several layers of polymer.

Heterogenous is made up of several layers which can improve the performance of the product. There is typically a wear layer over the pattern layer, so that the flooring can withstand greater use without showing signs of degradation.

Homogeneous is made as a single layer and is primarily PVC, with some fillers. As such, the aesthetic design may be more limited and there is no wear layer to protect the design.

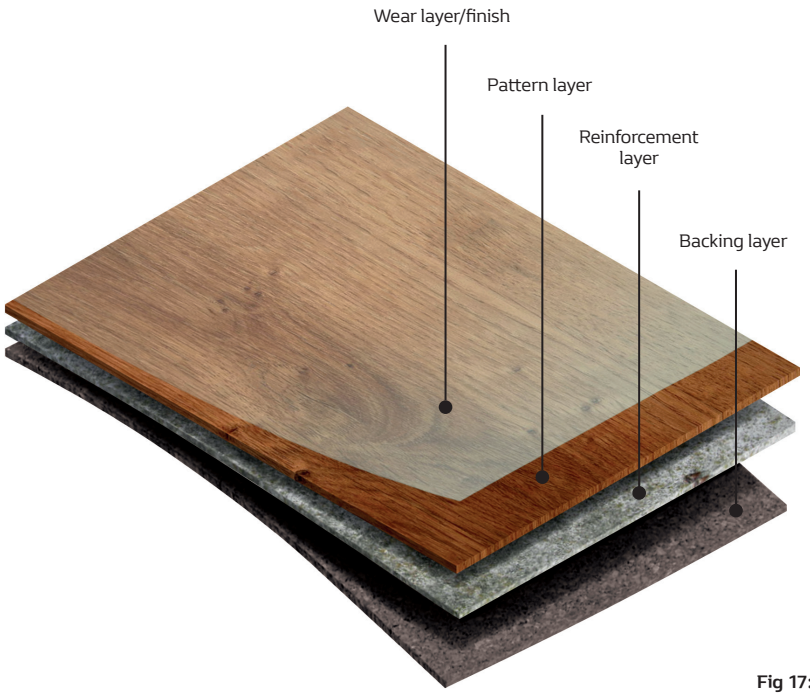


Fig 17: Heterogeneous vinyl sheet

Depending on the functional layers of the heterogeneous flooring, recycling may be more difficult. Glass fibre layers and heavily filled backings can be more difficult to recycle back into vinyl flooring.

Vinyl sheet products can also be split into safety and smooth. Safety flooring has aggregate or “grit” sprinkled into the surface to improve the grip on the flooring. This is used in commercial settings where anti slip properties are needed, such as in kitchens or wet rooms.

The grit within the flooring can make it more difficult to recycle, although by shredding and screening the flooring it can be removed. The wear on the

machinery is relatively high and so the cost to process compared to smooth is higher, but it is still recyclable.

Smooth, homogeneous flooring is the most recyclable type of vinyl sheet in that it can be recycled back into flooring. Other types can be recycled although not always back into flooring.

Vinyl sheeting is supplied in rolls, typically 2 or 4 meters wide and is cut to size. Sheet products are often fixed to the subfloor using adhesive. There are a very wide range of adhesive products on the market to meet different needs. When uplifted, standard adhesives will leave a residue on the product.

There are also loose lay or adhesive free sheet products on the market. These can be quicker to fit and when uplifted do not have the residue on. However the role of adhesive cannot be overlooked and provides vital functionality.

Luxury Vinyl Tiles (LVT)

LVT is a growing market in the UK. It provides the wear benefits and design freedom of vinyl flooring, but in a tile format. The challenge with LVT is the design of the product can vary widely.

LVT is a layered (heterogeneous) vinyl flooring format, in which there is a rigid layer. This rigid layer can be made from PVC so that the tile is made from compatible materials.

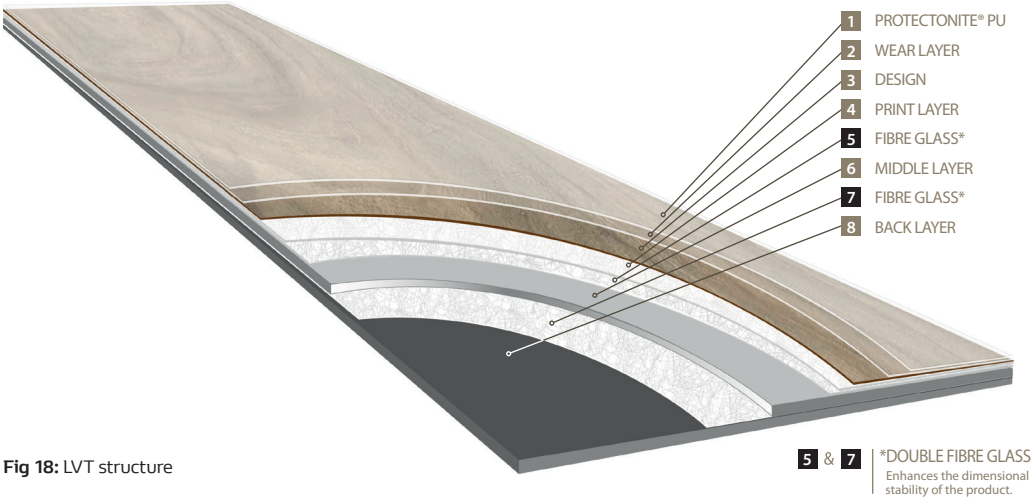


Fig 18: LVT structure

[13]

Because LVT is a tiled product, it has more re-use potential than vinyl sheet. As with the sheet product there are LVT products which require adhesion and ones which can be laid without adhesive.

Due to the very varied design in LVT, and the fact that much of it is made outside of the UK or Europe, recycling the product will be challenging. As with heterogeneous sheet, a level of open loop recycling can be used as non-flooring products may be able to handle the non-PVC element. However, if Zero Avoidable Waste is the aim, some changes to design to ensure all elements are compatible may be needed. Currently LVT is taken back by recycling schemes such as Recofloor, although the quantity is far less than smooth or safety offcuts. How the recyclers would handle greater volumes of LVT is not known.

13 Source: Moduleo® luxury vinyl flooring

SPC and WPC

Stone and wood plastic composite (SPC and WPC respectively) is a relatively new type of product. As with LVT, these are layered modular flooring solutions, but have a more rigid layer, whether made from a limestone composite or wood. This flooring can be more suited to environments with varying temperature (such as when underfloor heating is used) or can give benefits in terms of wear. However, the rigid layer in these products would make them very difficult, if not impossible, to recycle.

Linoleum

Linoleum is one of the earliest types of resilient flooring, being developed over 150 years ago. There is still a market in the UK and it can be supplied in tile or sheet format, with sheet being more common. Linoleum is made from naturally derived materials (linseed oil, pine resin, limestone, cork flour, wood flour, and jute). This means it benefits from not using a finite resource, such as petroleum based products.

Rubber

Rubber flooring is a very resilient type of flooring, often with wear properties exceeding many other types of flooring. As with vinyl and linoleum it can be supplied in tile or sheet format. The finish of the product is similar to that of homogeneous vinyl sheet, although it can incorporate a more three-dimensional finish.

Rubber flooring is vulcanised. This means it is treated using heat to "set" the product. Vulcanised rubber acts like a thermoset plastic and cannot be re-melted and recycled. This provides a high level of durability but prevents closed loop recycling.

Vulcanised rubber can be recycled into applications like play surfaces by shredding the product and binding it with another material. Technology such as pyrolysis can also be used to break down the rubber and produce a fuel that can be burnt. Rubber is used in very demanding commercial applications and would not be used in a domestic setting.

In comparison to vinyl products, both linoleum and rubber have a very small market share. The focus on achieving Zero Avoidable Waste must therefore be placed on vinyl, but in the long-term solutions will also be required for these more niche products.

Current Status of Recycling and Landfill Diversion Schemes

Vinyl

There are several schemes for the recycling of vinyl flooring detailed below.

Recofloor
Vinyl Take-Back Scheme

Fig 19: Recofloor logo

Altro and Polyflor: Recofloor

Recofloor is a national take back scheme for smooth and safety offcuts and smooth uplifted flooring. The scheme was established in 2009 and is funded by Altro and Polyflor. Specified types of vinyl flooring can be collected under the scheme regardless of manufacturer.[14] The scheme is unable to take uplifted safety flooring, SPC and WPC and cushioned vinyl flooring.

14 www.recofloor.org/

The scheme collects vinyl flooring in three ways:

- **Collection from over 50 flooring distributors across the UK. The distributors are provided with a 1100 litre bin from Recofloor. Customers of the distributor are then able to bring back vinyl flooring and place it in the bin. Customers can also collect flooring in clear sacks and bring this back to the distributor. The bins are collected by Altro or Polyflor depending on geographical location and swapped with an empty bin. The full bin is then returned to the manufacturer for processing. This collection method recovers a mix of smooth and safety offcuts, of many different designs and colours.**
- **Collection directly from flooring contractors. Contractors can be provided with a bulk bag to collect smooth and safety offcuts and smooth uplifted flooring separately. This means that larger quantities of a known flooring type can be collected. A small charge is applied to the collection of the bulk bags from the contractors and the material is transported to Altro and Polyflor, again depending on geography.**
- **Collection directly from construction/refurbishment sites. Bags can also be supplied to construction/refurbishment projects. This enables a large volume of offcuts of a single colour and type to be collected at once, which can facilitate closed loop recycling.**

The material collected through Recofloor can be recycled back into flooring providing the quality and type of the vinyl is compatible. Collection from construction/refurbishment projects provides the highest change of closed loop recycling.

Uplifted flooring cannot be recycled back into new flooring due to the potential presence of plasticizers and stabilisers which are now restricted under REACH regulations.

Flooring that cannot be recycled back into flooring is recycled into traffic management products. This is a large manufacturing industry in the UK, producing traffic management products from waste flexible PVC. This is not a “down-cycling” application as the products rely on the waste PVC. Without this material the traffic management products would need to be made from virgin PVC, and the costs associated with this would be prohibitive. As a result, the industry is only as strong as it is thanks to the collection and recycling of flexible PVC in the UK.

Recofloor shows the potential for vinyl flooring recycling in the UK. The scheme collects and recycles almost 600 tonnes of PVC flooring each year. Significant effort has been put in over the years to enable the collection of material that is free from non-flooring contamination for recycling.

The main barrier to further expansion is the difficulty in establishing collection at construction/refurbishment sites. With a driver to encourage collection at the sites, it could enable large quantities of clean material to be collected for recycling.

Forbo Back to the Floor

Forbo operate a collection scheme named “Forbo back to the floor”. This is a free collection scheme for a range of Forbo products[15] to collect clean offcuts.

Fig 20: Forbo back to the floor logo

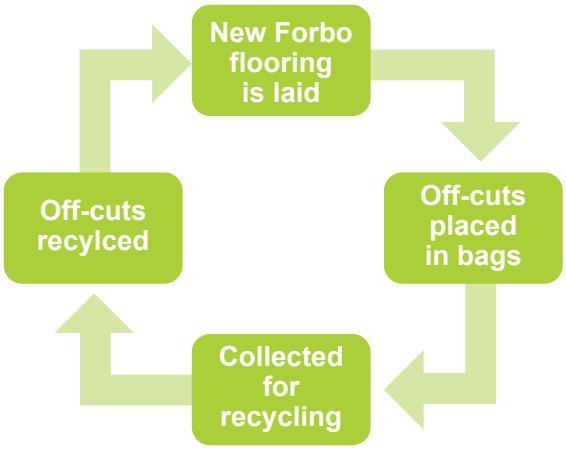


Fig 21: Back to the floor flow diagram

Material is collected from the contractors in bulk bags and is processed by Forbo. The scheme is not suitable for safety or uplifted flooring and does not accept flooring from other manufacturers.

Tarkett’s ReStart

Tarkett’s Restart programme is a globally operated take back scheme for a range of products[16] including:

- **Vinyl**
- **Linoleum**
- **Carpet tiles**

For vinyl and linoleum, only Tarkett’s own product will be collected, and only offcut material. This can then be recycled back into the flooring in a closed loop application. The scheme has not been launched in the UK fully, but has been successfully operating globally since 2010.

Tarkett’s ReStart takeback scheme recycles post use material and post installation offcuts. Between 2010-2018, 102,000 tonnes of flooring, including vinyl, linoleum and carpet, were collected in Europe and North America through ReStart. In 2018, 3,300 tonnes of installation waste was collected globally through ReStart.

Within Europe, Tarkett work with existing waste management companies in order to collect material, and use drop off sites to collect material.

Summary of Schemes

There are several ways in which clean offcuts can be recycled, with good opportunity for closed loop recycling. This puts vinyl flooring in a positive place when considering Zero Avoidable Waste, however there is still more material that could be collected, and more collection of post-use material is needed.

There are currently no collection schemes for the re-use of LVT. This is a potential opportunity to ensure the maximum value can be gained from the product before it reaches end of life.

15 www.forbo.com/flooring/en-uk/creating-better-environments/recycling-schemes/p110wl

16 https://professionals.tarkett.co.uk/en_GB/node/what-is-the-restart-programme-3941

Linoleum and Rubber

Recycling of Linoleum back into flooring is possible providing it is kept separate from other materials. The cost of transporting small quantities of waste to Europe for recycling can be prohibitive although Forbo collect their Marmoleum through their “back to the floor” scheme and Tarkett will be collecting linoleum through their scheme. As both schemes will only accept their own offcut material, there is an opportunity for a domestic collection scheme for any manufacturers offcuts if a domestic market can be established.

There are currently no landfill diversion schemes for rubber flooring.

Because of the small quantities arising of linoleum and rubber flooring, recycling will always be a significant challenge. In these cases, it will be vital for manufacturers to use reverse logistics to recover the small quantities of offcut material.

Uplifted material will be even more challenging. There is the potential to confuse linoleum and rubber with vinyl and dispose of it with other vinyl flooring if schemes exist. This may not be problematic, as the markets for uplifted vinyl flooring could likely tolerate the small level of linoleum and rubber flooring without significant issues.

Market, Waste Arisings, Recycling and Landfill Diversion Rate Estimates

Within resilient flooring, vinyl makes up the majority of products. It is not possible to split this down further into vinyl sheet and LVT due to the way in which data is recorded. These figures are estimates for the resilient flooring sold and recycled in the UK.

Currently, a relatively low recycling rate is achieved. This is not from lack of opportunity but is more constrained by the ability to collect large quantities from construction and refurbishment projects where the majority of waste arises as well as contamination from adhesives and levelling compounds still attached to uplifted flooring.

	MILLION M^2	TONNES
Placed on the market	50.00	**150000**
In house recycling	5.00	**15000**
Offcuts	2.50	**7500**
End of life	26.00	**78000**
Total waste	28.50	**85500**
Recycled	0.27	**800**

Fig 22: Resilient flooring recycling in the UK

Opportunities Towards Sustainability

For vinyl sheet, recyclable LVT and linoleum there are collection schemes that contractors can take advantage of. The schemes may need to expand to collect more material which may need additional funding, but the basic infrastructure is in place and could be expanded.

The larger opportunity is to enable the recycling of uplifted flooring and also to re-use LVT products. One development to aid this is the development of adhesive free or loose lay flooring. This would mean the level of contamination on uplifted flooring is considerably lower, enabling recycling into traffic management products or enabling the re-use of tile products.

Adhesives that also allow the flooring to be uplifted with minimal residue have also been developed. Adhesive free will not be suitable in all applications, and the adhesive plays an important part in the overall product performance. Further development of these products should be encouraged.

Wood Flooring

Solid Wood, Engineered and Laminate

Solid Wood

Hardwood sources for solid wood flooring are inherently a sustainable material source, provided that the forestry sources used are correctly managed and manufacturers purchasing raw material from these sources ensure that they are using registered FSC or PEFC producers. Manufacturers minimise losses by utilising offcut by-products such as long battens to separate wooden floorboards during the drying process or redirecting them towards other product streams such wear layers for engineered flooring products. Sawdust and small wood chippings are commonly pelletised and sent to energy from waste with many solid wood flooring manufacturers having on-site biomass boilers to generate heat for drying processes and power for their facilities. During the production process, 100% of the timber is used although approximately 70% becomes final product with 30% being diverted to energy production. The most common methods of laying solid wood flooring for commercial fits of solid wood flooring of 22mm thickness is through nailing. Flooring of 14mm thickness is usually glued down to a concrete base, limiting the potential for re-use. Some flooring manufacturers machine grooves into their floorboards to facilitate a clip lock system to join floorboards together, maximising the potential for re-use.

Engineered Flooring

Engineered wood flooring is commonly manufactured using a multi-layered plywood base with the whole board comprising between three and nine layers with a hardwood wear layer on top. The plywood layers are constructed with the grain of each layer running perpendicular to the preceding layer in order to improve structural integrity. In engineered wood flooring products, the wear layer is typically between 2.5mm to 6mm in depth. The layers are often bonded together under high pressure using a waterproof adhesive. After this the boards are machined to create the tongue and groove elements and the veneer on the top is planed. The boards then undergo sanding before the finishing process where two or three coats of finish are added. Boards are then packed and distributed for sale. Installation is predominantly through use of tongue and groove joints allowing maximum potential for re-use.

Typically, manufacturers will have reduced raw material wastage as far as economically practical. Some solid wood flooring manufacturers will produce a secondary engineered flooring product from offcuts of the solid wood production process. Other manufacturers of engineered flooring will produce many layers of veneer from a single plank of hardwood.

Laminate Flooring

Laminate flooring comprises the majority of the wood flooring market with approximately 30 million m^2 sold each year.

Laminate flooring is constructed from four layers. The bottom layer, known as a balancing layer is a moisture resistant backing made from plastic, paper or melamine, the next layer is the core HDF or MDF composed of wood fibres that are compressed together with adhesive and resin. The next layer is the decorative photographic layer. The top layer or wear layer is a durable top coat typically made from aluminium oxide or synthetic resin-treated cellulose.

Currently in the UK there is a limited market for re-use with some informal trading of uplifted laminate flooring from domestic projects or small scale office refits through auction or classified websites. The primary disposal pathway for laminate flooring is as a biomass infeed into energy from waste in permitted co-incinerators but is not suitable for clean waste wood combustion plants.

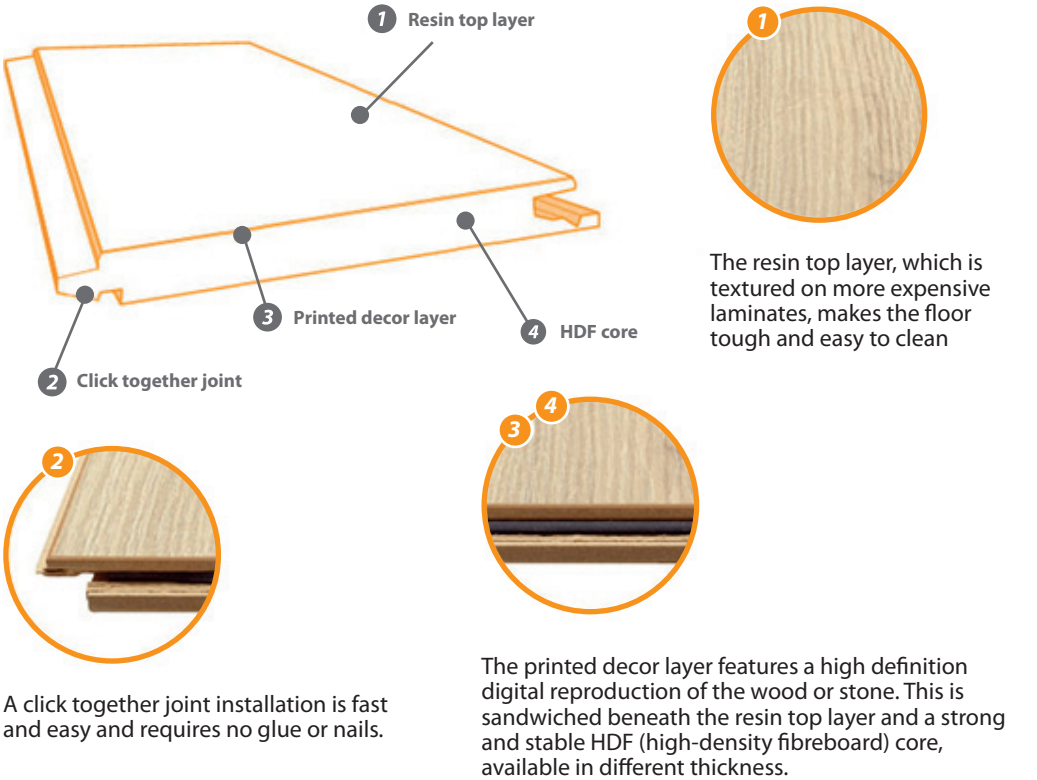


Fig 23: Laminate flooring construction [17]

Current Status of Recycling and Landfill Diversion Schemes

Currently, there are no established manufacturer or contractor funded take-back or recycling schemes for offcuts of timber flooring from the fitting process or at the end of life. This may be because there is perceived to be little economic benefit currently. There may be little demand to recycle uplifted timber flooring but some contractors specialising in solid wood flooring installation do offer an uplift and repurposing service. Solid wood floors have a lifespan of over 25 years and can be refinished many times through sanding and varnishing to give them new life. If a floor has to be uplifted, it can often be repurposed for other environments such as office spaces or sports halls, minimising the amount of material wasted. There is anecdotal evidence of

17 Image credit www.ukflooringdirect.co.uk

fitters re-using offcuts on site to make bespoke design patterns in new parquet flooring, stair treads and nosings.

There is a growing social enterprise movement in the UK for re-use of waste wood, the National Community Wood Recycling Project (NCWRP) was founded in 2003 as a network of 32-member social enterprises capturing waste wood from commercial and domestic projects. These social enterprises collect and divert waste wood material from householders and businesses ensuring that the material is kept in its natural form, allowing for it to be re-used rather than entering the commercial large scale recycling processes, converting good quality wood into chipboard or biomass for energy production, to re-use. As of 2018, the NCRWP had diverted over 20,000 tonnes of wood, of which 50% was re-used, including separating / repairing pallets, providing communities with wood for DIY and building projects. Other non-re-use outlets included making kindling for firewood during winter.[18]

Example of Circular Product Design

UNILIN have been awarded the EU Ecolabel for several of their branded laminate flooring products that utilise an innovative floating floor assembly technology called Uniclic which has been in use since 1997. This provides glue-less installation making it easy to take apart for re-use elsewhere. Further adoption of this and similar clip locking technologies where feasible in other wood-based flooring products would enable flooring contractors and demolition contractors to capture the material more easily during renovation or demolition works, ensuring the possibility of its re-use.

Example of Circular Business Models

The Dutch wood working company Herso uses reclaimed wood to make new products from furniture to flooring. Herso uses wood from old floors, furniture, cut offs from carpenters and from their own workshops. Herso's business model focuses on a deposit arrangement whereby the customer rents the product. The value of the product is predetermined and at the end of its use can be returned so that Herso can reclaim the material for use in new products and project.

Market, Waste Arisings, Recycling and Landfill Diversion Rate Estimates

Estimates of the UK market size for wood flooring have been compiled from discussions with EU and UK based wood flooring manufacturers, as well as publicly available data from the European Producers of Laminate Flooring market statistics.

	2017	2017	2019 (est)
Solid Wood	0.47	0.49	0.50
Engineered	6.70	6.80	6.90
Laminate	30.40	30.00	30.30
TOTAL	37.57	37.29	37.30

Fig 24: UK flooring market size (millions of m^2)

18 www.communitywoodrecycling.org.uk/about-us/our-impact/

Data for the amount of wood waste arising in the UK has been provided by the Wood Recyclers Association (WRA) based on their annual survey of members.[19] Figures from 2018 indicate 3.4M tonnes of waste wood was processed by WRA members which represents approximately 90% of the UK's waste wood industry. Based on these statistics, the WRA estimate the total UK waste wood market to be circa. 3.75M tonnes in 2018.

MARKET	%	Tonnage (2018)
Biomass	56%	2,100,000.00
Panel board	23%	862,500.00
Animal bedding	9%	337,500.00
Export	8%	300,000.00
Other recycling and re-use	4%	150,000.00
TOTAL	100%	3,750,000.00

Fig 25: UK wood waste processed product outlets 2018

Processed Waste Wood Outlets 2018

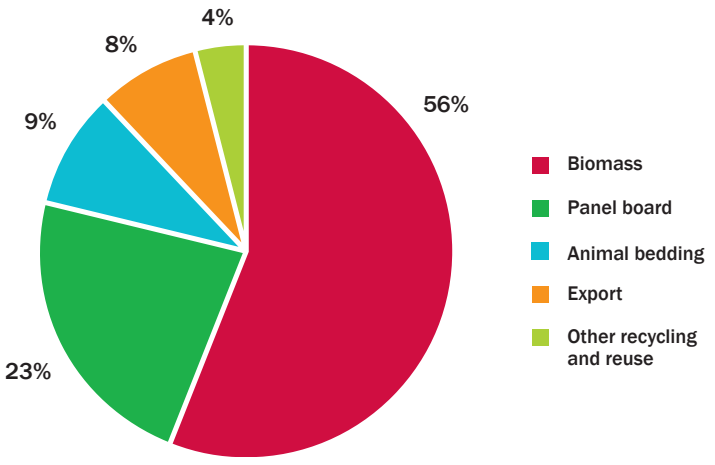


Fig 26: Processed waste wood product outlets for WRA members 2018

There was a 10% increase in the processing of grade A material (packaging waste wood) into animal bedding, and biomass wood fuel usage was up by 24% overall compared to 2017.

According to the WRA, there are approximately 30 large scale biomass plants planned in the UK. It is estimated that the demand for waste wood will exceed the amount the UK produces in 2020 leading to a requirement for some to be imported.

Opportunities Towards Sustainability

The majority of manufacturers of wood flooring products are working towards sourcing all their infeed material from 100% FSC or PEFC certified sources.

19 Wood Recyclers Association, Media release: Waste wood market remains buoyant according to WRA figures. 28th May 2019

Currently, there are no manufacturer or contractor funded take-back schemes established for waste wood flooring to be collected and, although there is an established re-use market for solid wood flooring through flooring contractors, this often relies on the contractor having a job lined up where the customer has specified that the flooring be from reclaimed sources. Community based social enterprises are making a difference and provide a good opportunity for the re-use of laminate and engineered wood flooring if householders and commercial flooring contractors can be made aware of enterprises operating in their local area. Increasing visibility of these enterprises would ensure that material is kept at its highest value and re-used, whilst also providing social benefits to the local community.

In terms of recycling, new technologies developed by MDF Recovery and its partners to recover wood fibre from MDF represents an opportunity to reduce the amount of this material going to landfill or energy from waste and can provide a feedstock to the manufacturers of MDF board, insulation products and formable packing materials.[20] Around 1 million tonnes of waste MDF is used in the UK every year with the majority being sent for energy from waste. MDF Recovery's process generates a wood fibre product that can be reintegrated into new MDF production creating a closed loop system.

Circular business models such as a product leasing or deposit-based product ownership may work well for wood flooring products as demonstrated by Herso due to the longevity of all wood flooring products and the propensity in the UK for the product to be uplifted earlier than its lifetime would require. The ease of uplifting, provided that glue-less floating flooring techniques are employed allowing the flooring to be uplifted with minimal damage or contamination also lends itself to a circular leasing or deposit-based business model. Engineered and solid wood flooring products are well suited for these models as they can be refinished after being laid in a new space, providing the next user with flooring that looks as good as new.

Summary of Available Recycling and Re-Use Routes

There have been significant advances made in the flooring sector to better manage waste and re-use products. Despite this, the recycling of flooring remains low as a result of numerous barriers. The table below summarises at a very high level what kind of infrastructure is available for the re-use and recycling of the different flooring types.

The table on the following two pages has been split into disposal by householder and disposal by contractor. The table is colour coded as follows:

No system exists to re-use or recycle

Very limited systems exist, showing the potential

Some infrastructure exists but may not be used by all contractors/consumers

Re-use is very unlikely due to nature of the product

20 www.mdfrecovery.co.uk

	DISPOSAL BY HOUSEHOLDER		DISPOSAL BY CONTRACTOR	
PRODUCT	**OFF-CUTS**	**POST-USE**	**OFF-CUTS**	**POST-USE**
Broadloom Carpet Recycling	Collection at some HWRCs for use in energy generation	Collection at some HWRCs for use in energy generation	Some offtake for dry material	Some offtake for dry material
Broadloom Carpet Re-use	No available route	No available route	No available route	No available route
Carpet Tile Recycling	No available route	No available route	Take back schemes by manufacturers and third-party re-use and recycling schemes	Take back schemes by manufacturers and third-party re-use and recycling schemes
Carpet Tile Re-use	No available route	No available route	Take back schemes by manufacturers and third-party re-use and recycling schemes	Take back schemes by manufacturers and third-party re-use and recycling schemes
Vinyl Sheet Recycling	No available route	No available route	National collection scheme Manufacturer specific collection schemes	Limited capture through national take back scheme
Vinyl Sheet Re-use	No available route	No available route	No available route	No available route
LVT Recycling	No available route	No available route	Limited capture through national take back scheme for recyclable products	Limited capture through national take back scheme for recyclable products
LVT Re-use	No available route	No available route	No available route	No available route
Linoleum Recycling	No available route	No available route	Take back by the manufacturer	No available route
Linoleum Re-use	No available route	No available route	No available route	No available route
Rubber Recycling	n/a	n/a	No available route	No available route
Rubber Re-use	n/a	n/a	No available route	No available route
Solid Wood Recycling	Collection of wood at HWRCs, sorted by recycler for panel board production or animal bedding Scavenging for firewood or scrap re-use in DIY projects	Collection of wood at HWRCs sorted by recycler for panel board production or animal bedding Donation to community wood recycling network	Possible collection, sorted by recycler for panel board production or animal bedding Donation to community wood recycling network	Possible collection sorted by recycler for panel board production or animal bedding Donation to community wood recycling network
Solid Wood Re-use	Possible private sale Scrap re-use in DIY projects	Possible private sale Donation to community wood recycling network	Possible re-use by contractor Donation to community wood recycling network	Possible re-use by contractor Donation to community wood recycling network

Continued on page 48

	DISPOSAL BY HOUSEHOLDER		DISPOSAL BY CONTRACTOR	
PRODUCT	**OFF-CUTS**	**POST-USE**	**OFF-CUTS**	**POST-USE**
Engineered Wood Recycling	Collection of wood at HWRCs primarily for energy recovery	Collection of wood at HWRCs, sorted by recycler for energy recovery Donation to community wood recycling network	Possible collection as wood waste for energy recovery Donation to community wood recycling network	Possible collection as wood waste for energy recovery Donation to community wood recycling network
Engineered Wood Re-use	Possible private sale Donation to community wood recycling network	Possible private sale Donation to community wood recycling network	Possible re-use by contractor Donation to community wood recycling network	Possible re-use by contractor Donation to community wood recycling network
Laminate Recycling	Collection of wood at HWRCs primarily for energy recovery	Collection of wood at HWRCs primarily for energy recovery	Possible collection as wood waste for energy recovery	Possible collection as wood waste for energy recovery
Laminate Re-use	No available route	Possible private sale Donation to community wood recycling network	No available route	Possible re-use by contractor

The summary table shows that effective routes for householders to recycle or re-use products are very limited. In the commercial area there are several opportunities available to recycle and re-use material, and so understanding the barriers as to why these do not achieve higher recycling and re-use rates is important.

List of Key Stakeholders[21]

Textiles

MANUFACTURERS	RECYCLERS	ASSOCIATIONS
Balsan	Anglo	Carpet Recycling UK
Brintons	Carpet Reclaim Ltd	
Cormar Carpet Co	Carpet Tile Recycling	
Desso	Desso Take back	
Ege	Envirocycle London	
Interface	Greenstream Recycling	
Milliken	Interface ReEntry	
Spruce Carpets	Midland Carpet Tile Recycling	

Resilient

MANUFACTURERS	COLLECTION SCHEMES	RECYCLERS
Altro	Forbo back to the floor	Heyside Plastics
Forbo	Recofloor (Polyflor and Altro)	JSP
Gerflor	Tarkett ReStart	Melba Swintex
IVC		Oxford Plastics
Polyflor		TPF
Tarkett		

Wood

MANUFACTURERS	RECYCLERS	ASSOCIATIONS
Altro	Forbo back to the floor	Heyside Plastics
Forbo	Recofloor (Polyflor and Altro)	JSP
Gerflor	Tarkett ReStart	Melba Swintex
IVC		Oxford Plastics
Polyflor		TPF
Tarkett		

21 Companies are listed alphabetically

QUALITY BY ASSOCIATION

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